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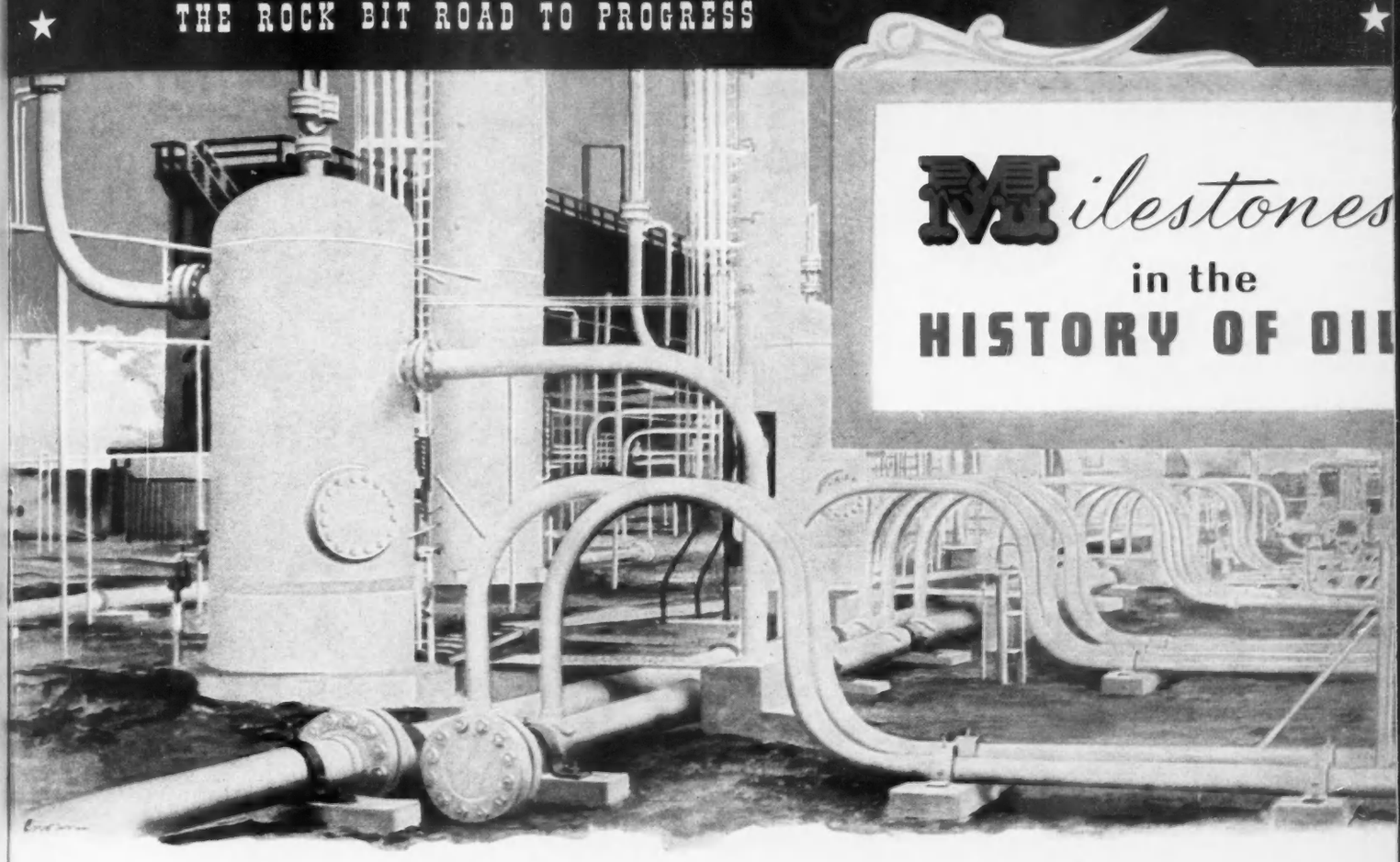
The OIL WEEKLY

FOR THE DRILLING, PRODUCING, PIPE LINE INDUSTRY

★ THE ROCK BIT ROAD TO PROGRESS ★



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*Reg. U. S. Pat. Off.

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R. L. DUDLEY, *President, Publisher* A. L. BURNS, *General Manager*

TOM W. NELSON, *Advertising Manager*

Specialized Oil Publications of
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Looking Ahead

WITH THE EDITOR

COLOMBIA is experiencing an extensive wildcat drilling program with the most recent payoff apparently being The Texas Petroleum Company's well in the Upper Magdalena Valley, Department of Boyaca. Operator has decided to set casing after recovering oil on a drill-stem test in sand at 7254-74 feet.

COLOMBIA ACTIVITY

Numerous other wildcat tests are active in the Magdalena Valley region, some projected to below 10,000 feet. Colombia's wildcat drilling campaign will be discussed by George O. Ives, staff writer, in the monthly international feature section of the next issue of THE OIL WEEKLY.

Ives visited South American oil fields last fall and secured data for the World Oil Atlas and for articles which have appeared in previous international feature issues. He is leaving this week for a second visit with our Latin-American neighbors to secure material for future authoritative articles.

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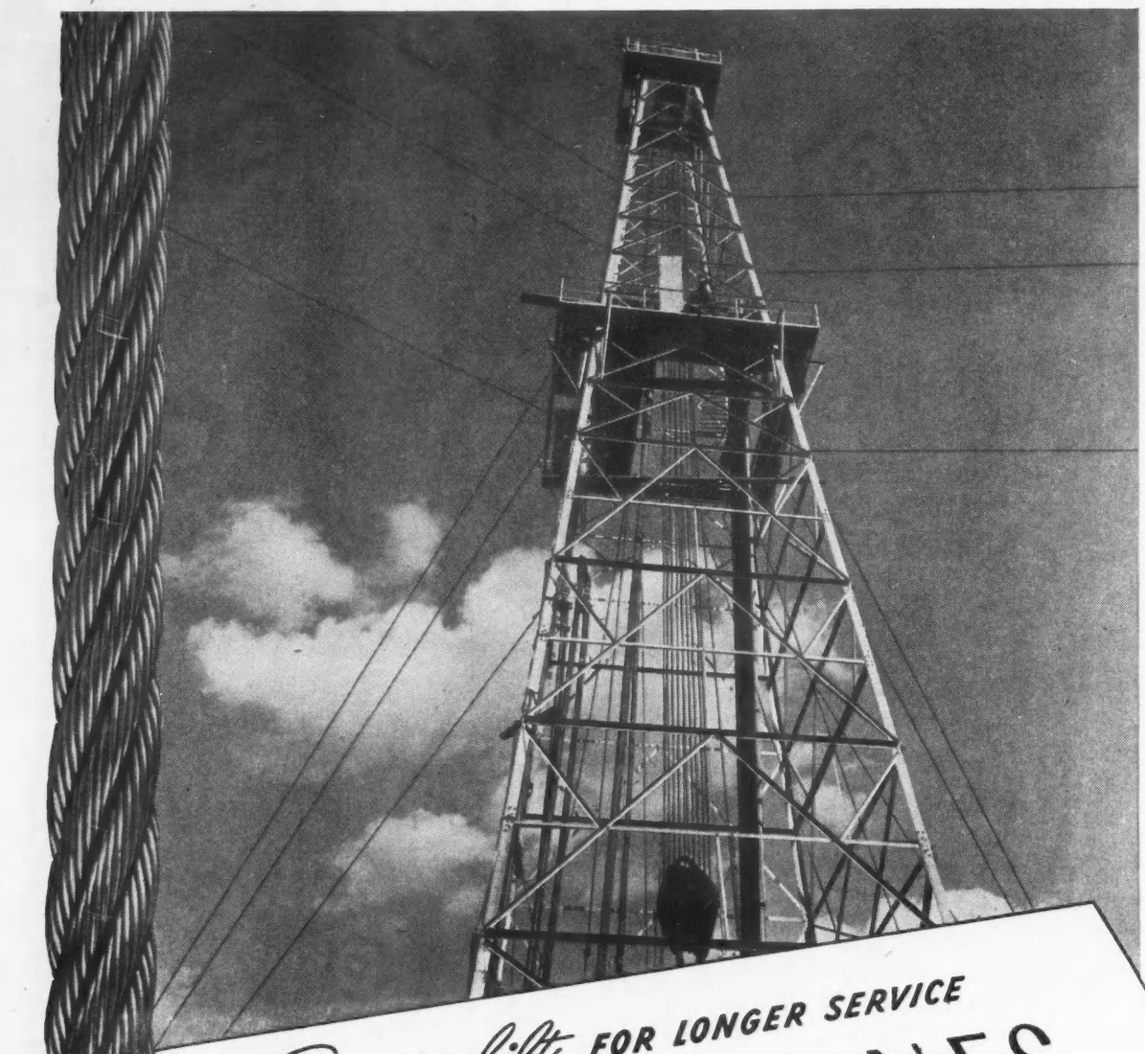

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THE OUTLOOK

Crude oil prices are expected to rise 25 cents a barrel if the decontrol provisions of the Senate bill are retained in the final Price Control Act. However, the rise may not come in one increase. A 25-cent jump, on top of the 10 cents previously allowed by OPA, would give the 35-cent minimum gain producers have been saying is necessary to offset higher costs.

* * * *

OPA's ruling that crude oil price control removal would leave no basis for computing payment to stripper well owners leave this class of operator out on a limb. Meanwhile marginal lease owners are pressing their fight for a permanent price differential regardless of the outcome of the present OPA fight.

* * * *

Congress and the industry will maintain a close surveillance over the activities of the Interior Department's oil and gas division, and any effort to impose any sort of peacetime control on oil will bring quick action at the Capitol. Department officials, however, emphasize they have no intention of undertaking to control the industry, but are looking to it for help in coordinating—and impliedly controlling—the government's widely scattered oil activities.

* * * *

Far more valuable uses for natural gas than as a fuel are confidently expected to be developed out of present research in synthetic fuels and its expanding use in chemical production. Ten million cubic feet a day, used as fuel, provides heat having a value of approximately $730,000 a year, but the same amount of gas would justify a $25 million investment in a synthetic chemical plant giving employment to 1500 persons and provide 200 million pounds of chemical products a year, with a value of many millions of dollars.

* * * *

The administration's economy drive aimed at balancing the budget for the fiscal year beginning July 1 shows signs of having bogged down, with expenditures now forecast at $39.5 billion, which is an increase of $3.6 billion over the forecast last January, with several spending proposals yet to be acted upon. Budget officials, however, believe that if non-programmed expenditures are kept to a minimum and hoped for $8 billion increase in revenues occurs it may still be possible for the government to get into the black.

* * * *

Owners of industrial properties seized by the government because of strike difficulties may ask the courts to determine whether the contracts made by the government with the unions, which they had to accept to get their properties back, are legal. Under the seizure procedure, the government replaces plant management in dickering with labor, frequently conceding more than management might, and relinquishes the property only when the owners make a similar agreement with their workers.

* * * *

The oil industry has a definite stake in the aviation agreements the administration is negotiating with foreign governments. Companies with production in the Middle East, for instance, may find their markets somewhat curtailed by Russia's refusal to permit American lines to fly over territory under her control. The agreements deal with the granting of landing and traffic rights, and a fight between the President and the Senate is brewing over the former's insistence that the pacts are of an executive character and do not require Senate ratification.

* * * *

Legislation for the reorganization of Congress, approved by the Senate, will not receive House consideration this year. For the oil industry, the major provision of reorganization is that for reducing the number of congressional committees, which would result in all matters affecting the industry being handled by one or two committees instead of by many which, under one pretext or another, can get into oil matters now.

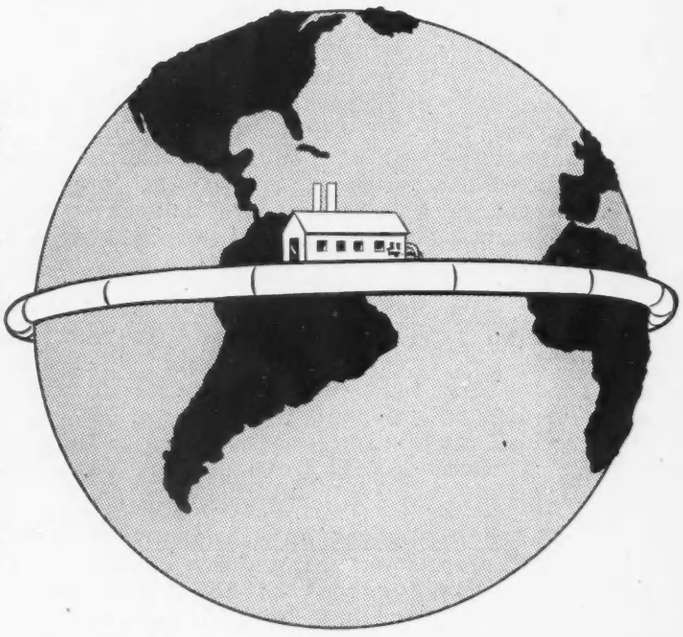
PIPE LINES . . . .

A Transformation In Transportation!

Transportation is one of America's most important industries; a major factor in transforming this country from a wilderness to a great nation.

Pipe lines, one of the basic forms of transportation, constitute a great network of arteries through which flow the products of the great petroleum industry —life blood of all industry and other forms of transportation.

Without petroleum and its by-products, there would be no modern railways, highways and airways; no modern motor fuel or motor oil to power or lubricate today's



trains, planes or motor cars; farm implements or industrial machines.

Williams Brothers Corp. is proud of its contribution to the pipe line industry; grateful for the privilege of constructing in the past 31 years more than 30,000 miles of pipe lines. Over mountains and rivers, through swamps, prairies and forests, on two continents, Williams Brothers organization has overcome the elements of time, temperature and terrain.

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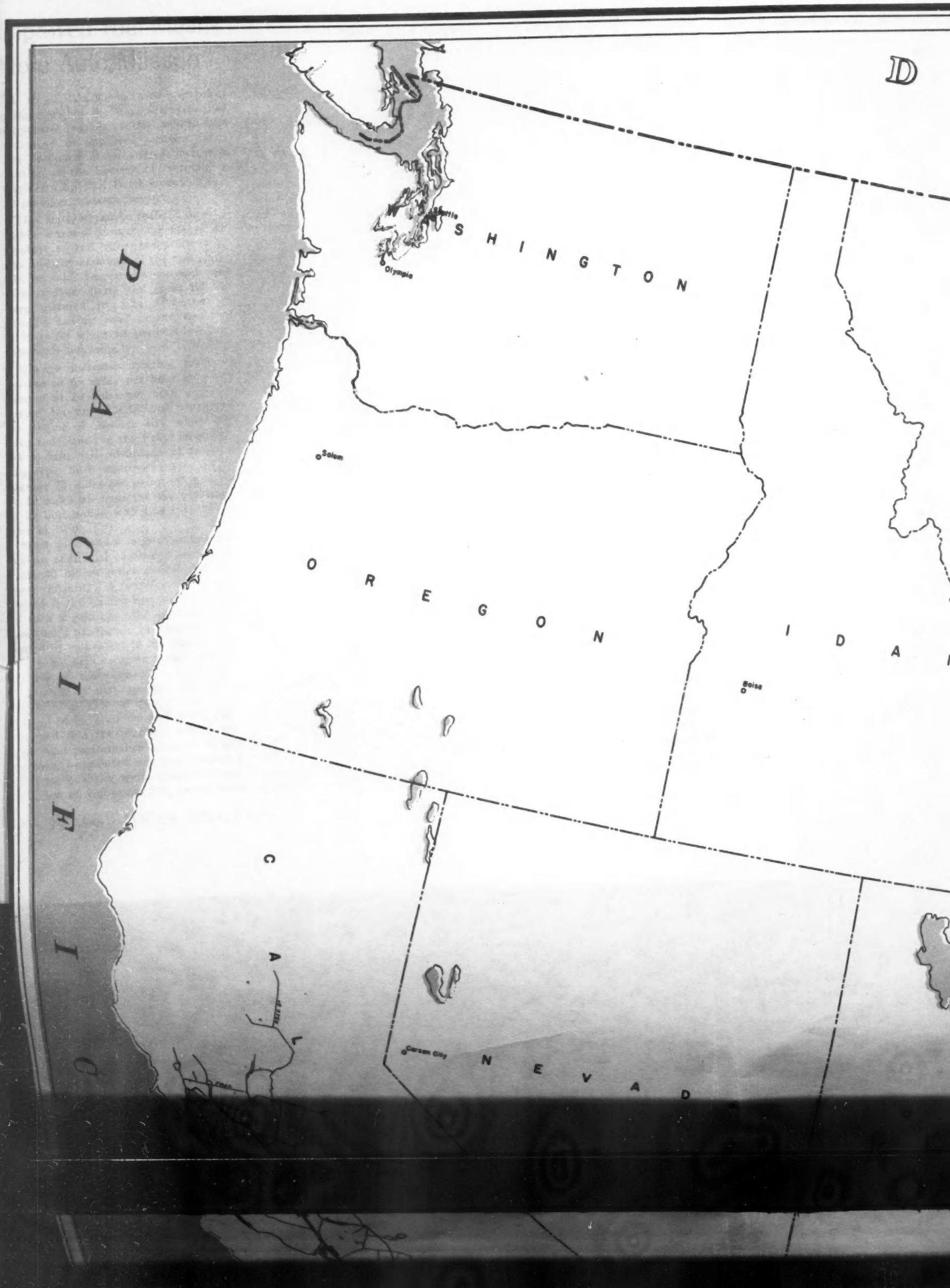
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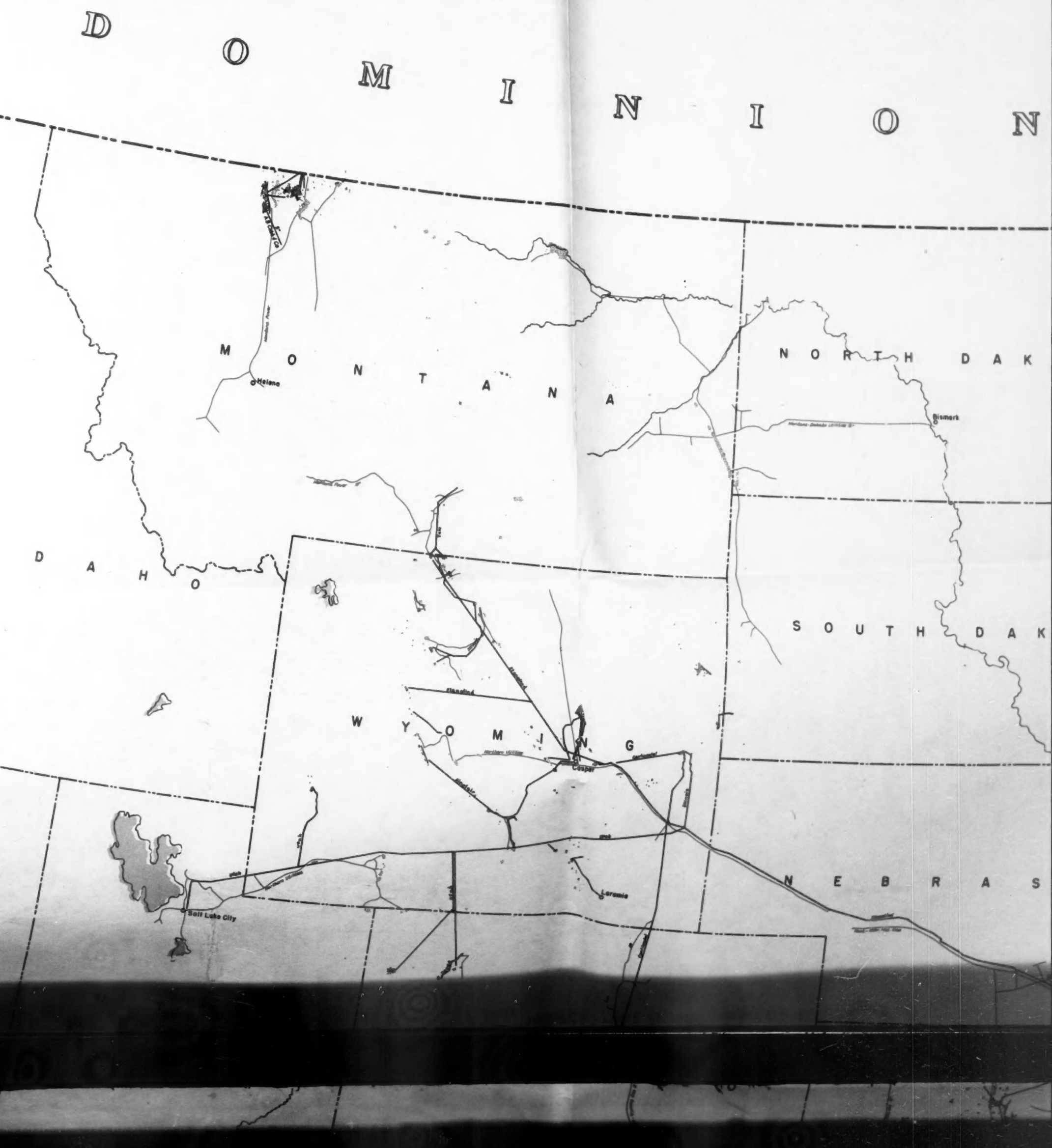

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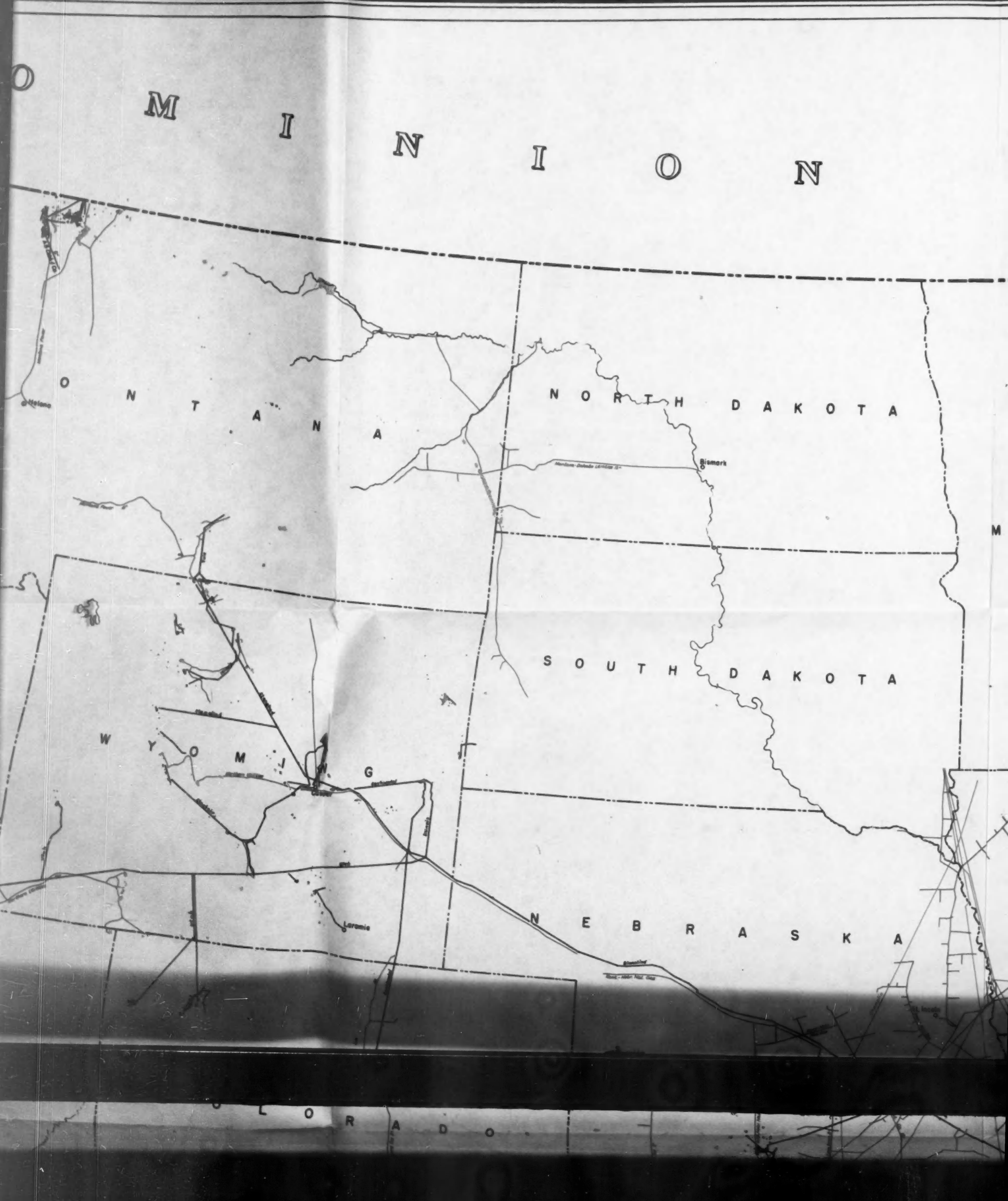

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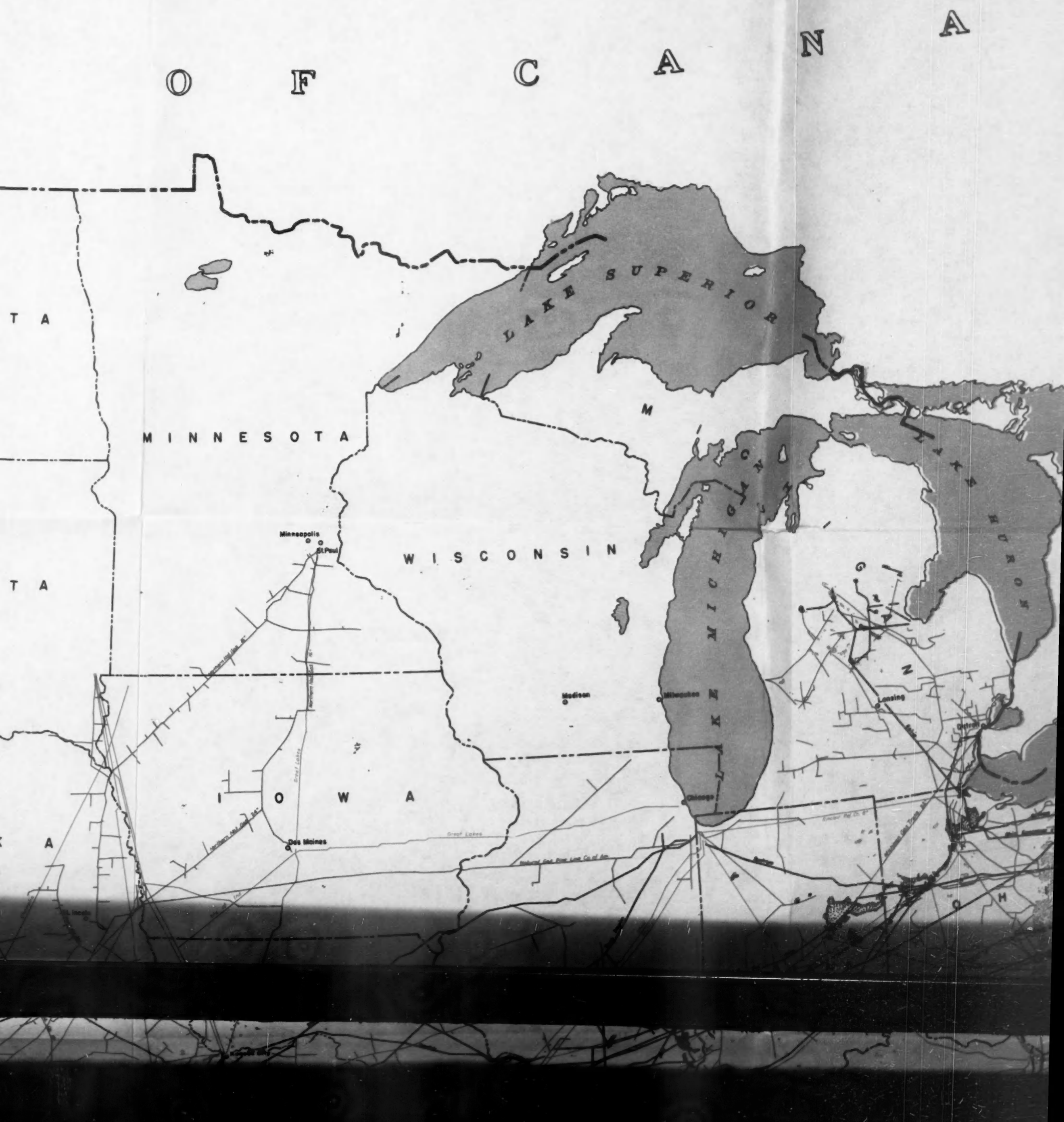

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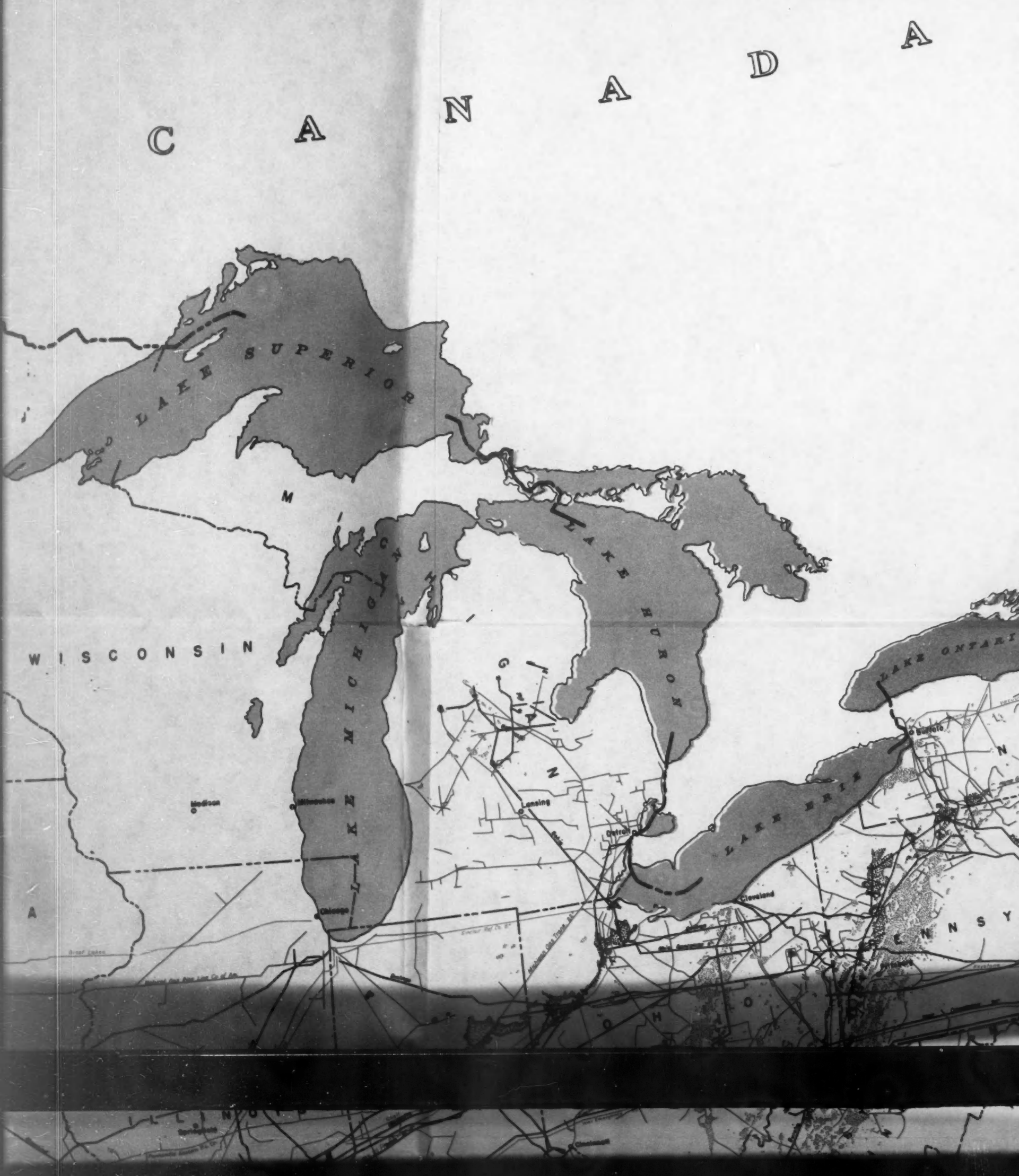

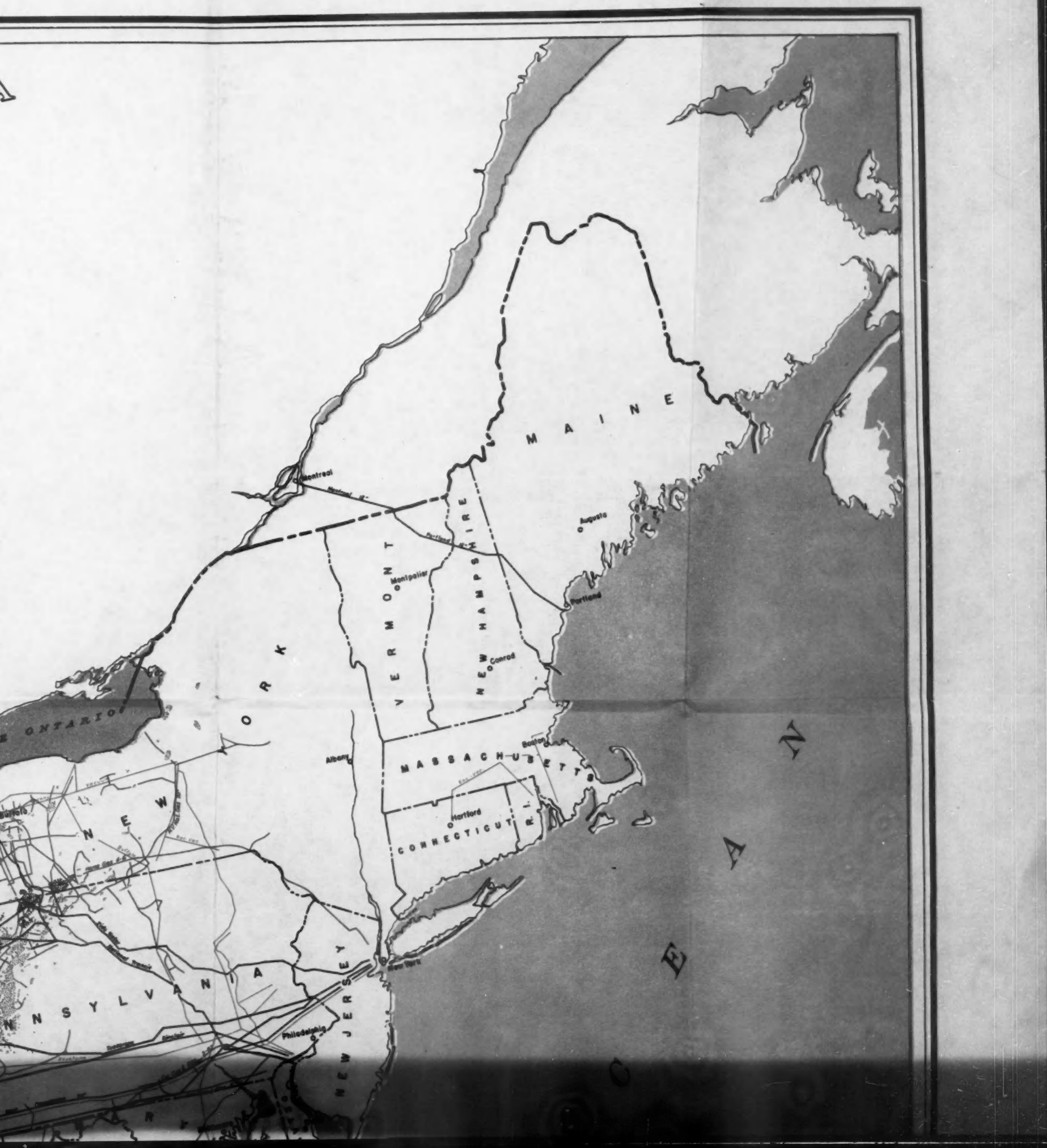
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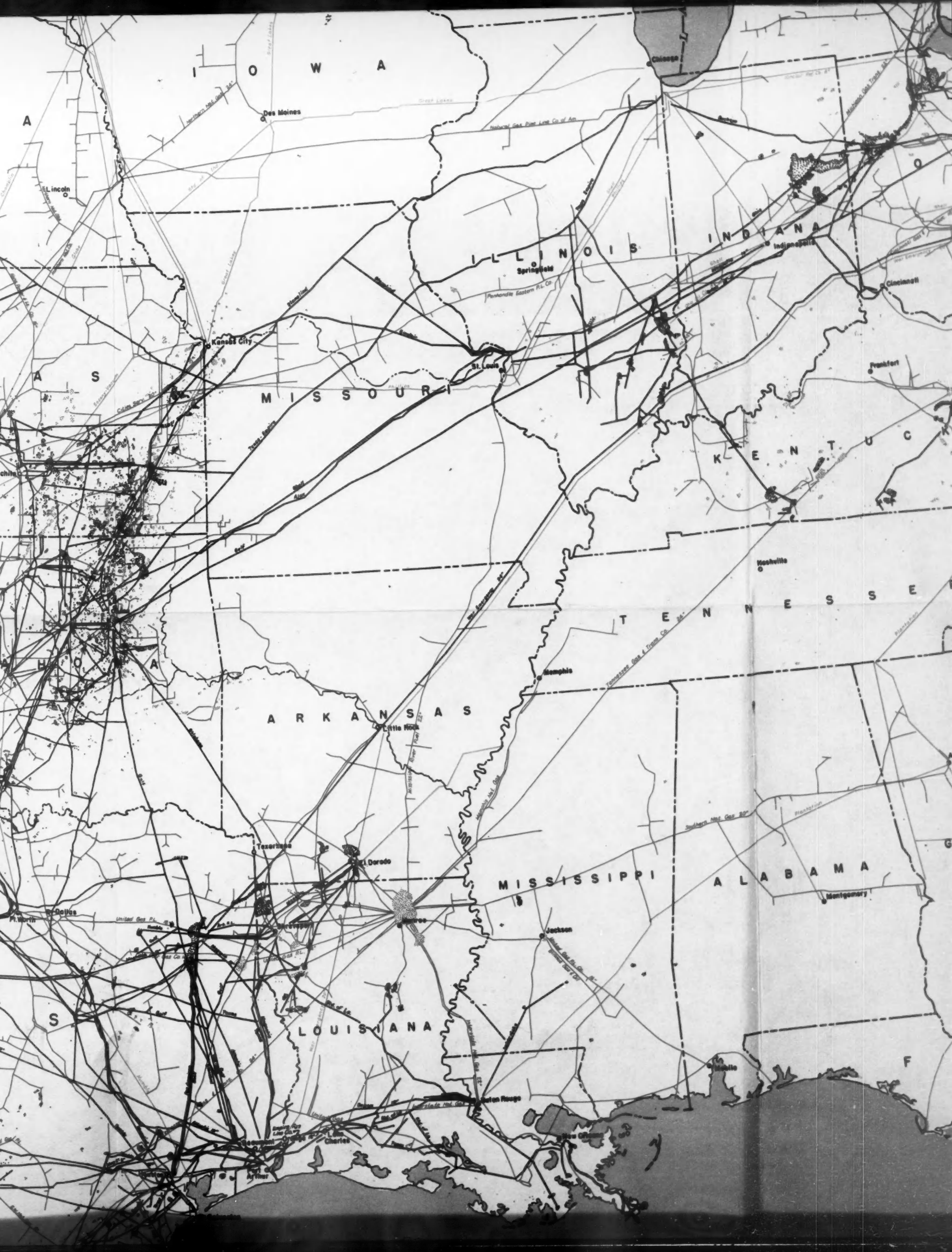
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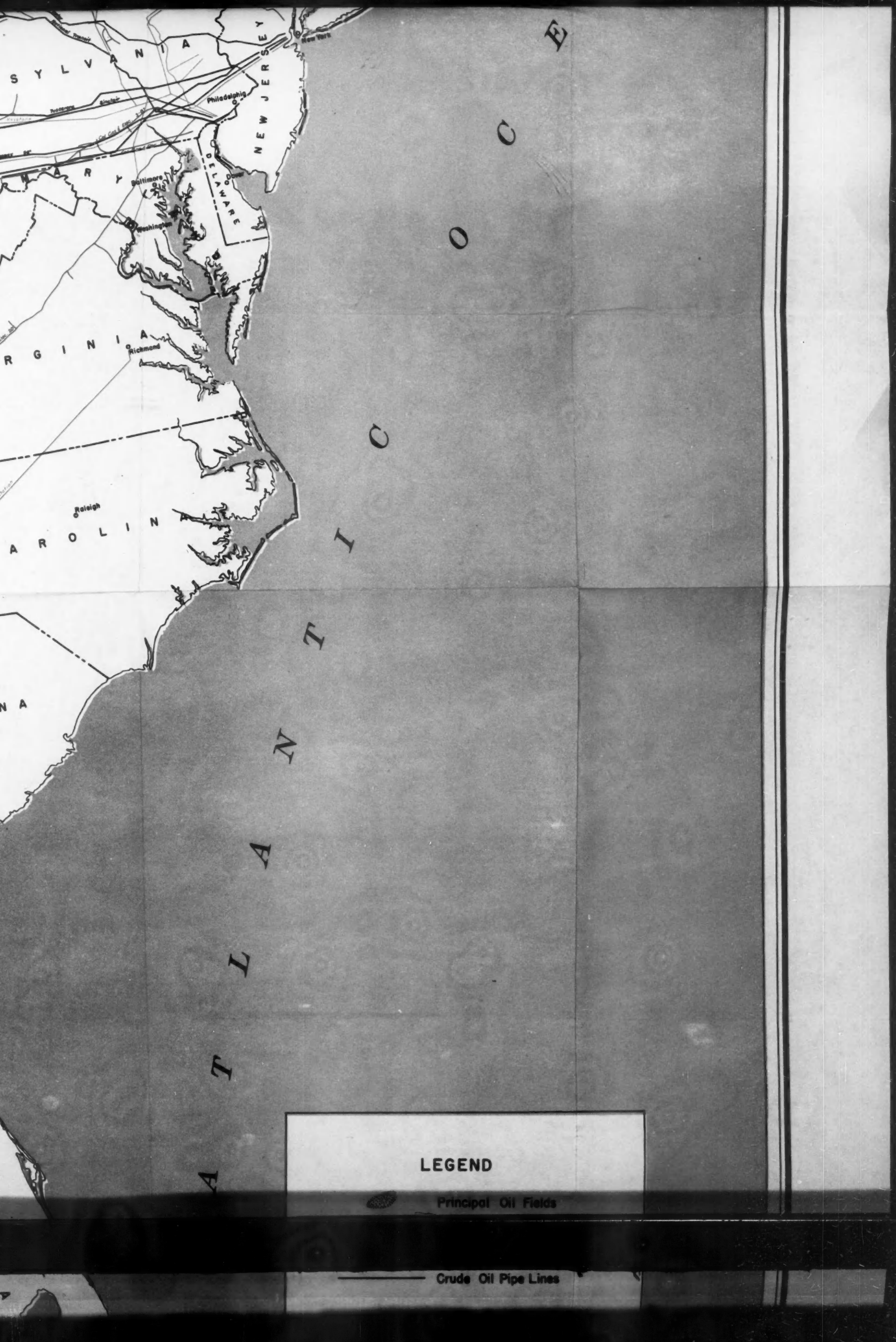
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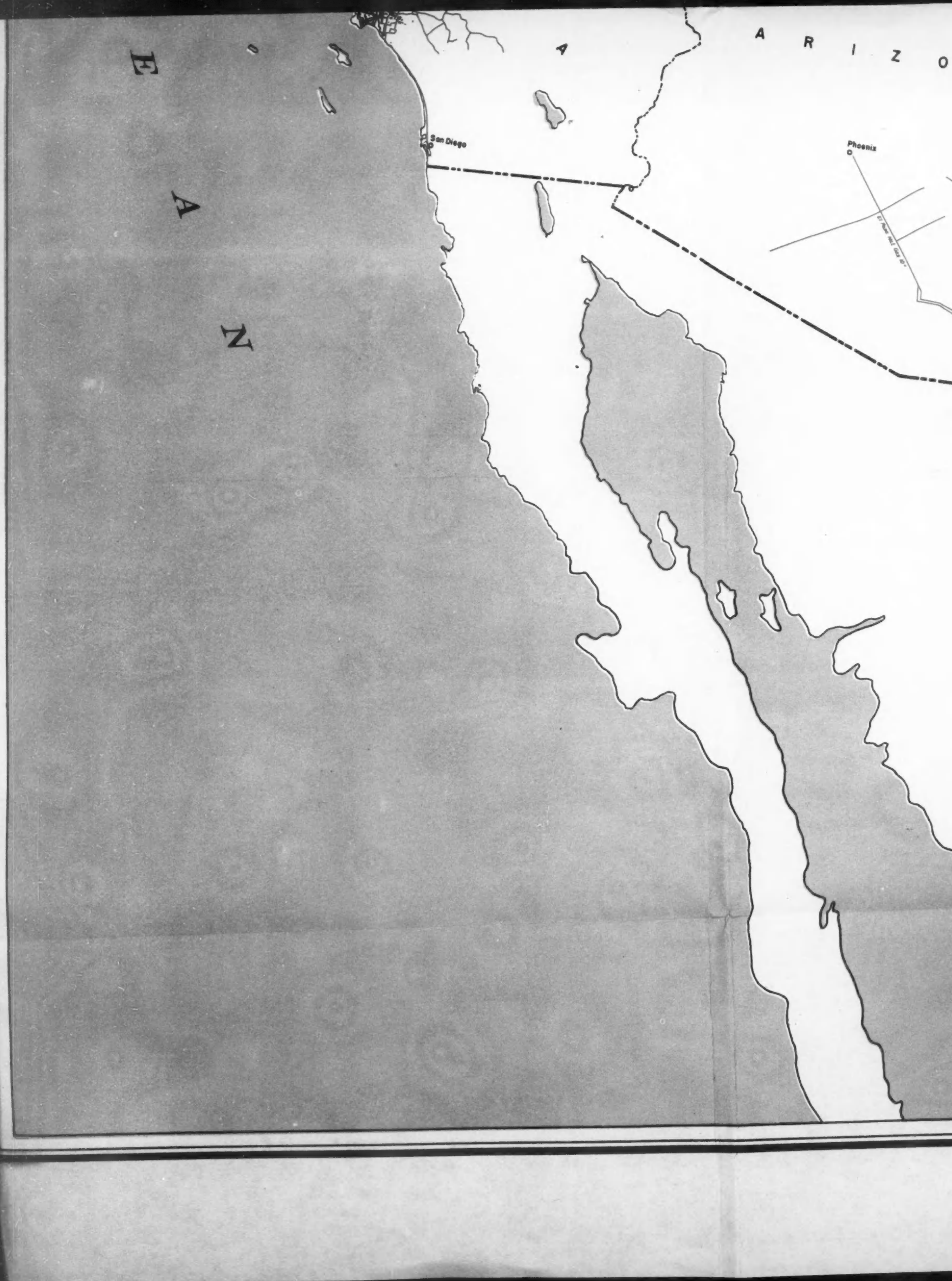
Crude Oil Pipe Lines



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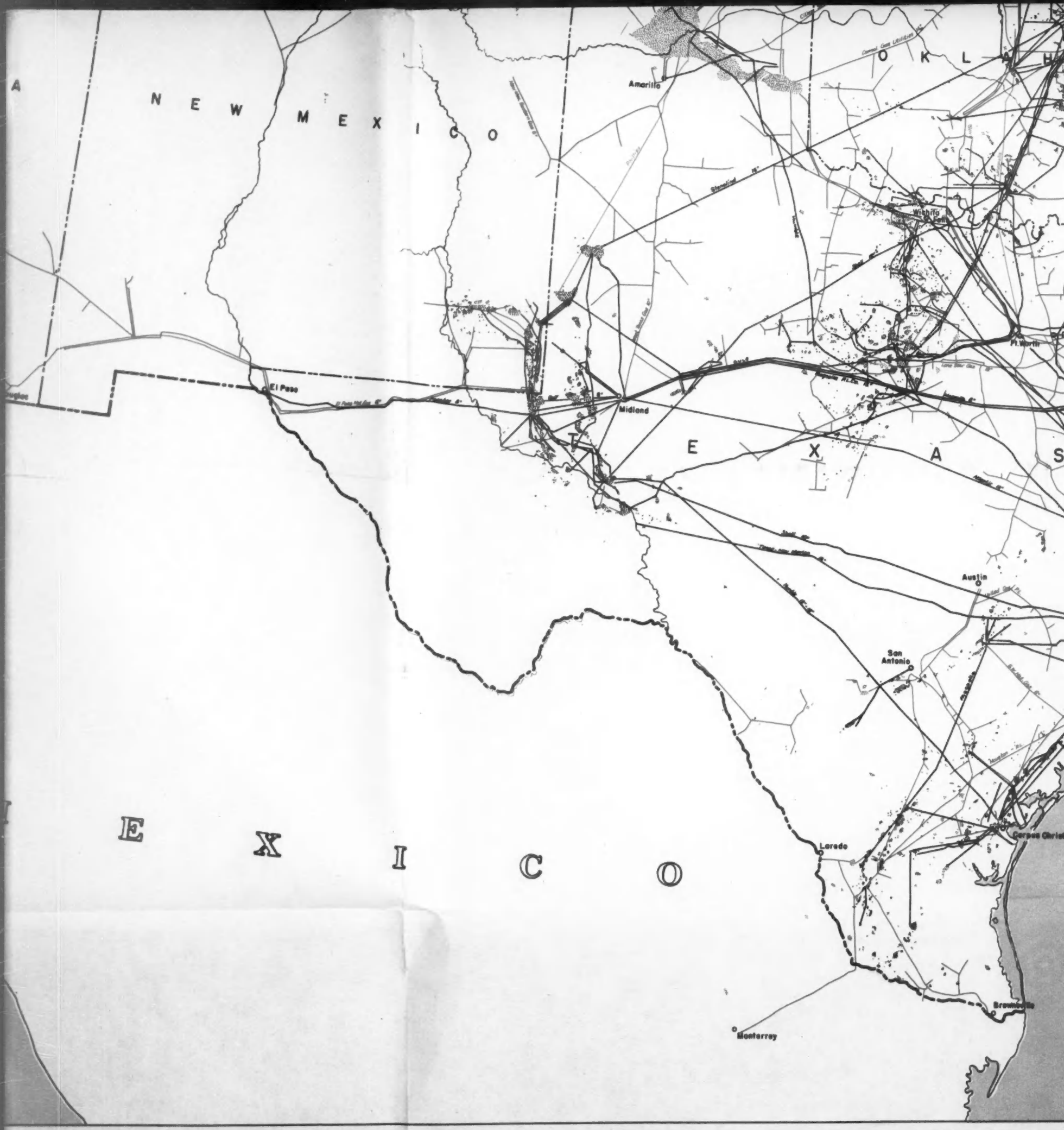
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Crude Oil Pipe Lines

Natural Gas Pipe Lines

Refined Product Pipe Lines

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UNIV. OF WISC.

Improved Fuel Means More Auto Mileage

A 20 PERCENT increase in gasoline mileage within the next few years, as automotive engines are designed to take advantage of improved postwar fuels, was predicted in an address before a meeting of the Society of Automotive Engineers by Earl Bartholomew, Ethyl Corporation research head.

This increase can be realized in automobile engines through the use of supercharging and higher compression ratios, and combinations of the two methods, he said. Engines of compact type with stronger parts and great rigidity were pictured to take advantage of gasoline having road octane numbers of 90 to 95 which he predicted will be commonly available.

Mileage increases ranging from 18 percent at 65 miles per hour up to 25 percent at 20 miles per hour were reported for an experimental passenger car engine of medium size which has been redesigned in the Ethyl laboratories to take full advantage of fuels of this type. Such improvement in design presage 25 miles per gallon of gasoline at 30 miles an hour for the purchaser of an automobile with this type of engine in 1950.

Such in advance would permit five million additional passenger cars to operate 40 billion miles annually on the same quantity of gasoline now consumed in the United States. The spread of such a gain over the average life of one year's production of passenger cars would be equivalent to the discovery of a new oil field containing half a billion barrels of crude oil.

Estimating that average gasolines available in 1950 will have octane ratings of 86 for premium and 80 for regular, and that the premium grades will give road performance above 90 octane number, he pointed out that gasolines of these qualities were being produced by a few oil companies this spring prior to the restrictions on gasoline imposed recently by the CPA in the program of reducing American consumption of metallic lead.

Need for Complete Oil Price Decontrol

A REAL problem is presented by the continued decline in the nation's crude stocks, a problem which in the opinion of Ernest O. Thompson, veteran Texas Railroad Commissioner, can be met only by prompt oil price decontrol "so that the profit incentive under the law of supply and demand can again be free to urge oil operators to drill as never before in search for oil."

Thompson points out that crude stocks decreased 328,000 barrels daily for the week ended June 8, this net drop being in the face of an increase in imported crude stocks. "A few weeks of such draw down on crude stocks would present a real problem," he said.

Gasoline stocks for the same week dropped 1,101,000 barrels, further indication of the fact that the oil industry is "enjoying" the strongest demand situation in history.

The commissioner cites today's production as 4,895,650 barrels daily compared with 4,853,414 barrels daily a year ago. The demand, however, has been 5,300,000 barrels daily, which, incidentally, is a half million barrels more than the 4,811,000 forecast made by PAW in November, 1945.

"We can't keep up this rate of production without new discoveries," Thompson says flatly. "The present oil fields will be sorely taxed to meet the demand. We must find new fields. The profit incentive has worked in the past and it will work again now if permitted to do so."

OPA's control of prices appears to be THE holdback. There appears to be little doubt but that the nation's economy, in which petroleum plays such a prominent role, would be better off with complete oil price decontrol.

"What Can Come From Small Ideas"

APROPOS of the final FPC Natural Gas hearing which opened last Monday in Washington, let's ponder a few excerpts from a talk made before the Eastern District meeting, API Division of Production, at Pittsburgh, by E. Holley Poe whose firm will present the Natural Gas Industry Committee's case.

"The purpose of the Natural Gas Act was made clear by those who formulated it and the positive duty was thereby imposed on the subsequent administrators to obey the letter but certainly not to overlook the spirit. . . . Broad implications of power for an administrative agency might be implied in the act but those implications are surely diversions from the intent of the lawmakers . . .

"No governmental agency should be allowed to embark on untried ventures in bureaucratic controls without the consent of Congress nor should it ever be allowed to chart new social or economic avenues for any industry or to impede the inherent right of management or deprive the public of the right to purchase . . .

"There is no more valuable inheritance than our founders' provisions for local self-government . . .

"Those who do not have (natural gas) want it. And some who have it, want more. But none of them want any interference with their use of the gas in manners that prevent full benefits from its efficiency, economy and convenience . . .

"Every advance made toward the absolute regulatory control of natural gas brings that same control nearer to your barrels of produced oil and your gallons of refined products . . .

"Those whose primary interest may be in petroleum would be well-advised to follow the course of the Washington hearing. Doubtless there will be new instances of the combined consideration of the oil and gas business—and, we know what can come from small ideas."

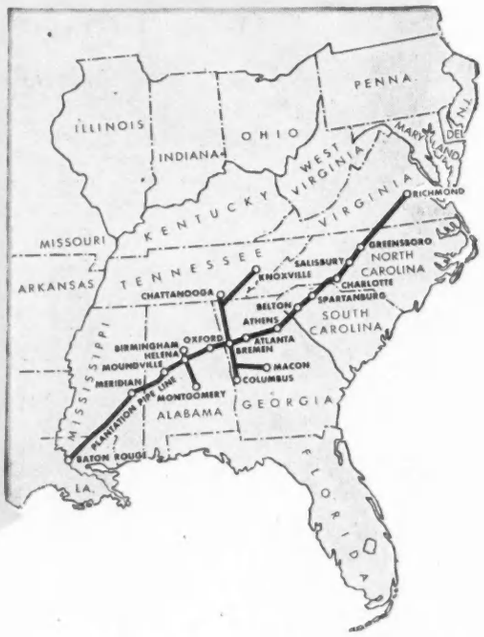
BJ PUMPS HAVE GUTS

Between 90,000 and 100,000 barrels pumped each day for 648 consecutive days...before the pump was even opened for inspection!

Three of these heavy-duty 8″ x 10″, 3-stage, Oil Line Multiplex Pumps were installed in December, 1941, at the starting terminal station (Baton Rouge) of the famous Plantation Pipeline. Fifty BJ pumps are installed along the entire line. Two pumps operate in series, developing a station output pressure of 950 psi, while the third is held in reserve.

And here's another factor that makes the story even more unusual: the pumps have operated continuously at *above-peak-load* output. Designed originally for an output of 90,000 barrels a day, the station has consistently pumped between 90,000 and 100,000 barrels a day. During one 24-hour period in December, 1944, output was 100,050 barrels...probably an all-time record for a 12-inch pipeline. And these BJ pumps are still going strong. We invite inquiries about your specific pumping problems

From Baton Rouge to Richmond, the famous Plantation Pipeline has a total of fifty BJ Oil Line Multiplex Pumps.



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HOUSTON • LOS ANGELES • NEW YORK

The Week's News

New Council Named—The new National Petroleum Council which will advise the Interior Department's oil and gas division held its organization meeting in Washington last week and mapped out its initial program. The council, promised to be predominantly representative of the independents, comprises 21 trade association officials, 7 natural gas men and 55 men actively engaged in the oil business; 55 of the members served on the PIWC. Page 59.

Peacetime Controls Watched—A full-dress review of OGD's aims was held by the Special Senate Oil Committee, with Chairman O'Mahoney indicating that its activities will be closely watched. He warned against any attempt for peacetime controls on the industry. Senator Moore opposes appropriation. First council meeting is held. Page 58.

Government and Wildcatting—Ways in which the federal government might contribute to the expansion of wildcatting activities were outlined by the Federal Trade Commission in a report to Congress. Although it made no definite recommendations, the commission went so far as to suggest that the government itself might finance the drilling of exploratory wells. Page 62.

Rubber Plant Disposal—Sale of 15 copolymer and 13 butadine plants engaged in the GR-S synthetic rubber program was recommended to Congress by WAA as preferable to leasing arrangements, but plants will be leased if satisfactory agreements cannot be made for their sale. Page 150.

Reopen Ammonia Plants—The Bureau of Mines' synthetic fuel demonstration plant program may be delayed as a result of decision to reopen all 15 of the synthetic ammonia plants (including the Louisiana, Mo., plant transferred to the bureau) to provide fertilizer materials for Germany and Japan.

Pipe Shortage Delays Projects—Field development operations may be facing severe restriction as a result of the shortage of pipe line pipe, on the basis of experience of the natural gas industry which has been advised that deliveries may be held up until late 1947 or 1948 unless additional steel allocaitons are provided. Page 63.

Record U. S. Production—Crude production, confounding most of the experts who a few months back ventured their guesses about postwar demand, has set a new all-time high record. Page 145.

FPC Gas Hearing—Final natural gas investigation hearings got under way in Washington and FPC hears definite expression of opposition by the gas industry to any extension of its authority. Story below.

Texas July Allowable—Despite heavier nominations, Texas allowable for July has been trimmed below the figure for June. Page 61.

Price Release Soon—OPA definitely expects oil prices to be released before July 1. Page 59.

Gas Industry States Its Opposition To Any Extension of FPC Authority

The Federal Power Commission was told last week that while the United States has a reserve of only 21,100 million barrels of crude oil, it has the equivalent of 25 billion barrels in its natural gas reserves and 6280 billion barrels in its coal.

These figures were presented by P. C. Keith, president of Hydrocarbon Research, Inc., during a week devoted chiefly to exploration of the use of gas as a material for chemicals and fuels as it might relate to the Commission's broad investigation of natural gas.

At the same time, the FPC heard the first definite expression of opposition to any extension of its authority from the natural gas industry as a result of the calling of two witnesses from the industry committee, which is not scheduled to present its side of the case until July 15.

John H. Poe, Tulsa attorney with E. Holley Poe and Associates strongly opposed any effort of the government to interfere in the producing and gathering branches of the natural gas industry, and Samuel H. Crosby of the same organization attacked the application of end-use restrictions by the Commission and recommended broad changes in its administrative procedure.

Poe asserted that the states have broad powers to enforce conservation of natural gas and that several have done so, and took the position that the producing states are doing a good job and officials close to the field of activities can handle the problem better "without interference with federal regulation, which may be considered as reaching back from the field of interstate commerce into the field of production and gathering."

During the course of the week, the FPC received estimates of possible gas reserves which indicated that known supplies may be only a part of the nation's total.

Predicting commercial production of gasoline from natural gas and coal within five years, Keith testified his company figures it can produce from gas at an overall cost of about 5½ cents a gallon, and predicted that successful operation of his plant would put a ceiling of about $2 a barrel on crude oil at the present ratio of reserves to production, he said, about four trillion cubic feet of gas is available for commercial use annually, from which about 800 million barrels of gasoline could be produced.

Keith warned that if the major southwestern producing states do not export their gas while there is demand for it in eastern and midwestern consuming markets, "they may wake up 10 or 15 years from now and find that the East is gasifying coal" and they have no market. Gasoline can be produced from coal at six cents a gallon.

Experiments indicate that by locating plants in the coal-producing states and piping to New York high Btu gas can be supplied at about 24.2 cents per thousand cubic feet at the New York City gate.

Reserves Estimate

Keith testified that the estimated proved reserves at the beginning of this year were 185 trillion cubic feet, but Hugh D. Miser of the Geological Survey placed the reserves in known oil fields at 140 trillion cubic feet with about half the area of the country appearing favorable for further testing for gas and with potential reserves yet to be discovered in deeper zones of the producing fields, in extensions of those fields and in new areas between them.

Miser said that regions which invite testing include those of the Appalachians, the central states from the Gulf to the Great Lakes and California and Rocky Mountain region.

First witness to discuss the industrial value of natural gas, Warren M. Watson, secretary of the Manufacturing Chemists' Association, told the commission that it has developed an entirely new branch of the chemical industry which has grown by leaps and bounds and is still growing.

"Natural gas and its components are of greater importance as raw materials than they are as a simple fuel," he said, pointing out that 10 million cubic feet a day burned as fuel has a heat value of only $730,000 a year whereas the same amount of gas for chemical use would

Pipe Line Map

A four-color map showing principal crude oil, natural gas and refined product pipe lines of the United States is inserted in this issue. We believe its wealth of detail makes it one of the most valuable of its kind ever published—The Editor.

justify the investment of $25 million in a plant employing directly about 1500 people and producing 200 million pounds of chemical products a year.

"The war may have been of some lasting benefit to the remaining natural gas supply since it has at least centered attention upon the importance of preventing waste of natural gas and of using gas in those ways in which it will be of greatest benefit to the country," Watson said. "It is sincerely hoped that those who engage in the future development of these reserves will give appropriate consideration to this very beneficial use, which enables a more complete utilization to be made of a resource which in years gone by has not been conserved too efficiently."

Interior's Activities

Activities of the Geological Survey and the Bureau of Mines in the field of gas were outlined by representatives of the Interior Department who touched upon the production of synthetic liquid fuels. W. C. Schroeder, chief of the office of synthetic liquid fuels, pointed out that there are numerous sources other than natural gas for the production of liquid fuels, and promised that at the end of the five-year research program being conducted by the Bureau basic information will be available on commercial costs of production with evidence of processes to put them in the range where they may be nearly competitive with petroleum, but how nearly will depend on the success of experimental work and the increased petroleum costs resulting particularly from the increased cost of exploration.

Cheap natural gas will undoubtedly be the first material to be used commercially for the production of synthetic liquid fuels, it was testified by Arno C. Fieldner, chief of the fuels and explosive branch of the Bureau, explaining that with natural gas costing not more than five cents per thousand cubic feet oil company engineers have estimated gasoline could be produced at from five to nine cents a gallon. However, he said, with considerably higher petroleum prices which may come in the future it will be economically possible to produce gasoline and diesel fuels by the Fischer-Tropsch process from solid fuels.

Pressure maintenance by the injection of gas permits the production of more oil with a lower lifting cost and in a shorter time in gas-driven fields and, if carried to the ultimate point, will result in the storage of natural gas that can be marketed as fuel, it was testified by Charles B. Carpenter, petroleum engineer of the Bureau.

Carpenter emphasized the need for unit operation of natural gas fields, but said that owners and operators are deterred from cooperative operations in part by fear of the anti-trust laws.

"Because of the fugacious character of natural gas," he explained, "positive engineering and mechanical control over the input and withdrawal of reservoir fluids is essential for ultimate success of any pressure-maintenance operation. The reservoir must be operated as a unit without regard to surface ownership.

Such control can be achieved only by unitization or cooperative agreements between the owners and operators, and as a rule these agreements cannot be obtained readily.

"Unitization is legal, and even enforceable, in some states, but in others, Texas for example, only agreements for cooperative development of natural gas fields are declared lawful. Fear of violation of the state and federal anti-trust laws has been advanced by some owners and operators as one reason for not entering these cooperative activities, whereas, many times, the owners cannot be convinced of the merit of pressure maintenance. If an owner holds title or lease to the land overlying a substantial part of a reservoir, he usually can proceed safely with a contemplated pressure-maintenance project."

"Wait and See" Attitude Toward Oil Council Seen in Capital and Industry

Government-industry cooperation contemplated under Secretary of the Interior J. A. Krug's plans for the Oil and Gas Division may prove one way to prevent unreasonable extension of federal controls, Acting Director Ralph K. Davies told 54 oil and gas men meeting June 21 for the first session of the National Petroleum Council.

Walter S. Hallanan, president of Plymouth Oil Company, was named temporary chairman and Russell B. Brown, general counsel of IPAA, temporary secretary Davies outlined the various steps taken in the council's formation, saying that they would have the utmost freedom to act, within the framework of the limitations laid down by the department of justice and existing law, to assist in the effort to coordinate the petroleum activities of 27 government agencies which have an interest in oil matters.

Industry's Position

The position of the natural gas industry on the question of further control was made clear by the industry committee in a formal statement as the hearings opened.

The investigation, the committee declared, was "prompted by the intervention of coal and railroad interests in practically every case which has come before the Commission in recent years wherein an interstate pipe line company filed an application for a certificate to extend an existing pipe line or to construct a new line.

"These opposing interests have consistently fought the expansion of natural gas markets through this intervention maneuver, and have contended that the commission, in hearing these pipe line applications, should consider the economic effect that would result; in other words, whether or not natural gas service to the proposed area would adversely affect the coal and railroad industries.

"The natural gas industry has insisted there is nothing in the Natural Gas Act that warrants the commission giving consideration to these matters—that under the act the commission should consider only whether the natural gas service is demanded in the area to be served, whether the applying company has sufficient supplies of natural gas to give adequate service for a reasonable number of years and whether the applying company is financially and otherwise qualified to render the service."

No Extension of Control

Krug told the council flatly that there is no intention of extending federal regulation but merely to coordinate it, and asserted that whatever the new division undertakes will be based on practical considerations.

He explained that there is no intention of interferring with other departments whose oil functions are working smoothly, discussing this point in answering a question as to operations in the foreign field and Army and Navy secret contracts. Foreign operators would still take their problems up with the State Department, and suppliers would continue to work directly with the Army and Navy, he declared.

Members made it clear that the two points uppermost in their minds are the possibility of intensified government control and the antitrust phases of the projected partnership.

Some requests were made for clarification of Attorney General Clark's letter which gave the same opinion that the Department gave to all similar inquiries during the war—that it recognizes that such committees may be a valuable source of information and advice and the Department has never taken the position that consultation between the government and an industry committee violates the antitrust laws.

No Antitrust Immunity

However, he warned, "consultation does not involve the determination by the industry advisory committee itself of policies or the administration of programs which should be the responsibility of the government agency. The authority to consult and advise should not be considered as implying that members of such committees are authorized to get together and reach an agreed position in anticipation of such consultations. The determination of policies is the sole responsibility of the government agency served by the committee."

Membership on the council will not be regarded as conferring on the participants any immunity from the antitrust laws, Clark added.

As the meeting broke up, many members of the council appeared still uncertain over its road and the possibilities of accomplishing anything constructive,

but said they would have to wait and see what developed at the next session when an actual program is expected to be presented.

"Wait and See"

This "wait and see" attitude toward the new council and its future had appeared previously.

Skepticism was evidenced earlier in the week at a called hearing of the Special Senate Oil Committee when Undersecretary of the Interior Oscar L. Chapman and Acting Director of the OGD Ralph K. Davies were thoroughly quizzed by Chairman Joseph C. O'Mahoney and Senator E. H. Moore regarding the extent to which the division would seek to centralize government oil activities, its methods, and the membership of the council.

The two department officials emphasized that whatever was done would be within the framework of law and that they recognized the requirement that Congress pass on all consolidations, whether through the Reorganization Act or by legislation.

Davies told the committee that when he came to Washington in 1941 he found some 27 agencies dealing with oil in one way or another "with the result that administration of oil affairs was inefficient and ineffective."

O'Mahoney pointed out that while the PIWC and other industry advisory committees established during the war were provided for by law there is no statute covering the setting up of such organizations in peacetime and the only foundation for the new council was provided by President Truman's letter last month instructing Secretary Krug to undertake the coordination of federal oil activities.

Davies explained that, properly set up, the division will be relied upon by government agencies for advice on policy matters, but that the council itself could initiate discussions, although there would be some subjects, such as price, which it could not touch because of the antitrust laws or other barriers.

"To what extent the actual oil functions will finally be centralized in this particular division remains to be seen," he said. But, he added, there are other fields also where it could be useful, citing the Internal Revenue Bureau which has an interest in oil which cannot be separated from the Treasury Department but might be helped to coordinate its activities.

Cooperation Needed

Davies repeatedly emphasized the desirability of continuing the government-industry relation which worked so well during the war, and said that other federal officials who have discussed the matter with him have "been cooperative."

The membership of the council, he said, has tentatively been fixed at 85, as against 72 for the PIWC, but the actual size will be left to the council itself. The organization will be predominantly independent, he assured the committee.

Not once during the hearing was any question raised as to the Department of Justice's position regarding members. Davies some weeks ago sent a list of the names to the department, which was returned without comment with each man's antitrust record.

Davies testified that it is proposed that the members of the council be appointed for one year only "so that it is not embarrassing to revise the list at a later date."

Advisory Duties

"The council will advise any department on any question brought to it," he said, "and may initiate discussions of its own."

The limit of its activity, however, will be to make recommendations regarding changes in administration or policies, and the aim, he said, "is greater efficiency on the part of the government in handling its oil responsibilities."

O'Mahoney emphasized that the OGD must not attempt to set up any form of peacetime control over the oil industry, and Chapman and Davies assured him no such step was contemplated.

War and Navy representatives of the Army-Navy Joint Petroleum Board made cautious statements that the division could be helpful as an intermediary to give the industry information regarding military requirements, specifications and other matters.

The reluctance of the industry to commit itself was evidenced when Joseph Dwyer, assistant to President William R. Boyd, Jr., of American Petroleum Institute, declined to comment, while Russell B. Brown, general counsel of the Independent Petroleum Association of America, voiced doubts of the desirability of basing the new council on the PIWC membership because of the entirely different problems which will come up for consideration.

Joseph E. Keller of the National Petroleum Association, however, said he anticipated full industry cooperation, and H. M. McClure of National Stripper Well Association believed that the division could do a great deal of good in the field of conservation and extension of the interstate compact to states not participating, but emphasized that the council could be composed predominantly of production men because "production is the cornerstone of the industry" and if it is stabilized, refining and transporation will offer few problems. Frank Porter of Mid-Continent Oil and Gas Association did not commit himself.

O'Mahoney pointed out that many oil men may not be able to get to Washington for council meetings and suggested that the department consider going into the field to the industry. He also urged the department to keep in close touch with his and other congressional committees, and suggested that it may become the duty of his group to recommend a statute which will set up the formula by which a representative industry council is to be selected if Davies' plans do not work out.

Senate Discusses OGD

The Senate also had its first chance to discuss the Division during the week, taking up the supplemental appropriation of $222,608 which, with the $216,908 provided for enforcement of the Connally hot oil act, will finance it during the coming fiscal year.

After the Senate had approved the fund, Senator Moore obtained reconsideration and attempted to block it as "unnecessary and inadvisable," urging that the plan for the Division be sent to committee so that the industry might have an opportunity to present its views.

"To increase the appropriation by some $200,000 is a total waste of money, and will serve no useful purpose, in my opinion," he said.

The proposition was defended by O'Mahoney, who told of the hearing his committee had held. Davies, he said, agreed that: "War controls have been definitely ended; that there is no purpose to set up any form of peacetime control over the petroleum industry; that it is the object of the administration to coordinate the executive function of the federal government; and that in doing so you are seeking to bring about the appointment of an advisory council in order that there may be understanding and cooperation between the executive arm of the government and the industry—all of this being based upon a recognition of the fact that the policy-determining branch of government still is the Congress."

The fund was approved without a record vote.

Price Release Expected Soon

OPA officials definitely expect oil prices to be released the end of this month under the price control extension bill now in the hands of a conference committee, and are making their plans to close the fuel division almost immediately. No great concern is expressed over the prospect of termination of oil control, which they said has merely been hastened a little and was in the cards for the near future, even if the bill asked by the OPA had been enacted.

Officials were most disturbed over the termination of the stripper-well subsidies, which are definitely tied to ceiling prices, and said, while studies are being made to see what can be done, it appears that continued relief for stripper-well operators can be had only through a new directive, unless the industry itself takes action through either a horizontal increase in crude prices or special prices for stripper-well production.

Membership

Assertedly preponderantly representative of the independents, the new National Petroleum Council was announced last week by Secretary of the Interior J. A. Krug.

Krug named 85 men, 78 of them representative of the oil industry, as the initial membership of the council, to serve without compensation for one year. Twenty-one members will be repre-

sentative of the oil trade associations and seven will represent natural gas.

Fifty-five of the appointees served with the PIWC at one time or another, and were used as a nucleus in organizing the new council, Krug said, "both because of the outstanding caliber of the individuals and also because of the need to take advantage of their unique experience in working with government in the cooperative solution of wartime problems."

Quarterly Meetings

Krug pointed out that duplicate company representation, which proved necessary for the wartime organization but was protested by the independents, who felt it gave the major companies undue influence, has been eliminated.

Following the organization meeting June 21, it is planned to have the council meet quarterly in Washington. A number of national committees will be set up, however, to carry on various projects between meetings and prepare material for consideration at the formal sessions.

Krug advised appointees as follows: "In view of the outstanding contribution which government-industry cooperation made to the success of the war petroleum program, it is important that the value to the welfare and security of the nation of such close and harmonious relations between government and industry should continue. Accordingly, in harmony with the President's direction, I am, in consultation with Ralph K. Davies, the former deputy petroleum administrator for war, creating an industry advisory group, to be designated as the 'National Petroleum Council,' whose membership will be drawn from both large and small interests so distributed as to insure a truly representative group."

Council membership is as follows:

List of Members

K. S. Adams, president, Phillips Petroleum Company, Bartlesville, Okla.; H. T. Ashton, president, Western Petroleum Refiners Association, St. Louis; Col. T. H. Barton, president, Lion Oil Company, El Dorado, Ark.; Burt R. Bay, president, Northern Natural Gas Company, Omaha; R. H. Blair, president, National Oil Marketers Association, Troy, Mo.; Jacob Blaustein, Alto Dale, Pikesville, Md.; Paul G. Blazer, chairman of board, Ashland Oil & Refning Company, Ashland, Ky.; W. R. Boyd, Jr., president, American Petroleum Institute, New York; Reid Brazell, Leonard Refineries, Inc., Alma, Mich.; J. S. Bridwell, president, Bridwell Oil Company, Wichita Falls, Texas; Russell Brown, Independent Petroleum Association of America, Washington, D. C.

W. F. Clinger, president, Pennsylvania Grade Crude Oil Association, Tidioute, Penn.; Robert H. Colley, president, The Atlantic Refining Company, Philadelphia; Stuart Crocker, president, Columbia Gas and Electric Company, New York; Howard A. Cowden, president, Consumers Cooperative Association, North Kansas City, Mo.; Henry M. Dawes, president, The Pure Oil Company, Chicago; E. De Golyer, De Golyer and MacNaughton, Dallas; O. D. Donnell, president, The Ohio Oil Company, Findlay, Ohio; Fayette B. Dow, National Petroleum Association, Washington, D. C.; J. Frank Drake, president, Gulf Oil Corporation, Pittsburgh; Gordon Duke, Southeastern Oil, Inc., Jacksonville, Fla.; J. H. Dunn, president, Natural Gasoline Asociation of America, Amarillo, Texas; James P. Dunnigan, Producers Refining Co., Inc., West Branch, Mich.

Leroy Edwards, president, Southern California Gas Company, Los Angeles; Richard Fenton, executive vice president, California Stripper Well Association, Los Angeles; W. H. Ferguson, executive vice president, Continental Oil Company, Denver; R. G. Follis, president, Standard Oil Company of California, San Francisco; Jacob France, chairman of board Mid-Continent Petroleum Corporation, Tulsa; Walter S. Hallanan, president, Plymouth Oil Company, Charleston, W. Va.; D. P. Hamilton, president, Root Petroleum Company, Shreveport, La.; Jake L. Hamon, Cox and Hamon, Dallas; B. A. Hardey, Shreveport; George A. Hill, Jr., president, Houston Oil Company of Texas, Houston; W. T. Holliday, president, Standard Oil Company (Ohio), Cleveland; Eugene Holman, president, Standard Oil Company (New Jersey), New York; D. A. Hulcy, president, Lone Star Gas Company, Dallas; W. F. Humphrey, president, Tide Water Associated Oil Company, San Francisco; H. L. Hunt, Hunt Oil Company, Dallas.

A. Jacobsen, president, Amerada Petroleum Corporation, New York; B. Brewster Jennings, president, Socony-Vacuum Oil Company, Inc., New York; Allen A. Jergins, president, San Joaquin Valley Oil Producers Association, Long Beach, Calif.; Carl A. Johnson, president, Independent Refiners Association of California, Inc., Los Angeles; Charles S. Jones, president, Richfield Oil Corporation, Los Angeles; W. Alton Jones, president, Cities Service Oil Company, New York; Frank Lerch, president, Consolidated Natural Gas Company, New York; Ralph Lloyd, president, Western Oil and Gas Association, Los Angeles; John M. Lovejoy, president, Standard Oil Company of Delaware, New York.

B. L. Majewski, vice president, Deep Rock Oil Company, Chicago; A. C. Mattei, president, Honolulu Oil Corporation, San Francisco; Clyde Morrill, executive vice president, Independent Oil Men's Association of New England, Boston; S. B. Mosher, president, Signal Oil and Gas Company, Los Angeles; Henry D. Moyle, vice president, Wasatch Oil Refining Company, Salt Lake City; H. M. McClure, president, National Stripper Well Association, Alma, Mich.; N. C. McGowen, president, United Gas Pipe Line Company, Shreveport; W. G. McGuire, chairman of board, Panhandle-Eastern Pipe Company, Kansas City, Mo.; Joseph L. Nolan, manager, Oil Department, Farmers Union Central Exchange, St. Paul, Minn.; I. A. O'Shaugnessy, president, The Globe Oil and Refining Company, St. Paul, Minn.

J. R. Parten, president, Premier Oil Refining Company of Texas, Houston; William T. Payne, president, American Association of Oil Well Drilling Contractors, Oklahoma City; J. Howard Pew, president, Sun Oil Company, Philadelphia; Joseph E. Pogue, Chase National Bank, New York; Frank M. Porter, president, Mid-Continent Oil & Gas Association, Oklahoma City; H. J. Porter, Houston; E. E. Pyles, Los Angeles; E. B. Reeser, Barnsdall Oil Company, Tulsa; Walter R. Reitz, president, Quaker State Oil Refining Company, Oil City, Pa.; M. H. Robineau, president The Frontier Refining Co., Cheyenne, Wyo.; W. S. S. Rodgers, chairman of board, The Texas Company, New York; Charles F. Roeser, president, Roeser and Pendleton, Inc., Fort Worth; Arch H. Rowan, Rowan Drilling Company, Fort Worth; G. L. Rowsey, president, Gulf Coast Refiners Asociation, Taylor, Texas; R. S. Shannon, president, Pioneer Oil Corporation, Denver; Harry F. Sinclair, president, Sinclair Oil Corporation, New York; W. G. Skelly, president Skelly Oil Company, Tulsa; Hugh Glenn, president, Petroleum Equipment Suppliers Association, Butler, Penn.; Reese H. Taylor, president, Union Oil Company of California, Los Angeles; H. L. Thatcher, chairman, National Council of Independent Petroleum Association, Chattanooga, Tenn.; R. Van Der Woude, president, Shell Union Oil Corporation, New York; W. W. Vandeveer, Allied Oil Corporation, Cleveland; Grady Vaughn, Dallas National Bank Building, Dallas.

Eric V. Weber, president, Ohio Petroleum Marketers Association, Cincinnati; W. C. Whaley, president, Oil Producers Agency of California, Los Angeles; H. C. Wiess, president, Humble Oil & Refining Company, Houston; Robert E. Wilson, chairman of board, Standard Oil Company (Indiana), Chicago; Ralph T. Zook, The Sloan and Zook Company, Bradford, Penn.

French Said Negotiating For Supply of Petroleum

Negotiations reportedly are going on between French representatives and a number of operators for the supply of a considerable volume of crude oil to be paid for out of the credit recently granted through the Export-Import Bank.

According to reports reaching Washington, France will pay a bonus of 23 cents per barrel. The deals, however, were said merely to be in process of negotiations, since the Price Control Act stands in the way of agreements in excess of ceiling prices, and are understood to be planned with a view to consummation after oil price controls are eliminated.

OPA Allows Adjustments On Products and Crudes

Gatherers and marketers of crude oil with ceiling prices frozen below their costs were authorized by OPA June 21 to make applications for higher price ceilings, permitting the price agency to make individual adjustments for crude oil resellers with increased costs that threaten to curtail their deliveries.

It was explained, however, that adjustments will be granted only where the purchaser is unable to obtain deliveries at the same or lower price and where a need will not be created for an increase in prices at another delivery point.

OPA also increased ceilings in three crude condensate fields, giving the Paloma and South Coles Levee fields in California a uniform ceiling of $1.45 per barrel, to which may be added the overall 10-cent increase recently allowed in all crude ceilings. This is an increase of 12 cents a barrel over the ceiling formerly applicable to most sales from the two fields. The third field, Opelika, Texas, also is given a $1.40 ceiling, to which may be added the 10-cent increase, an increase of 20 cents a barrel which will bring the field up to the general level in the surrounding area.

Manufacturers of carbon black will be permitted after July 1 to enter into contracts for natural gas at ceiling prices already applicable to pipeline purchases for use as heat, light or fuel, in a move designed to prevent the diversion of gas supplies at the expense of carbon black.

Pemex Ends Dispute

Distribution of petroleum products in the Mexico City area has been resumed following a dispute between the Petroleum Workers Syndicate and Petroleos Mexicanos, government-controlled oil industry.

Pipe line workers had shut off supplies of oil and products from the Poza Rica and Vera Cruz fields in demand that the syndicate members be given control of distribution instead of private distributors.

An agreement signed by Pemex calls for Pemex to put into circulation equipment now available and establish distribution service in several other towns as soon as it receives equipment.

Rubber Price Set

The United States has won its fight to keep the cost of natural crude rubber below 25 cents a pound and an agreement has been reached between this government and those of Britain, the Netherlands and France for a price of 23½ cents per pound during the last half of the current year.

Texas July Allowable Cut Under June Figure

The Texas Railroad Commission has set the July oil allowable at 2,386,381 barrels daily, which is 26,326 barrels daily less than for June. Fields may produce 27 days, one more than in June. However, the East Texas field was set at 21 days.

Actual crude produced under the July order is estimated at 2,256,562 barrels daily, plus 173,346 barrels of natural gasoline and distillate for a total of 2,429,908 barrels daily of all oils, which is 319,908 barrels higher than the Bureau of Mines estimate.

As a corrective measure in West Texas, the commission ordered the Yates field shutin four additional days in June and then decreased its allowable 7877 barrels to 42,000 barrels daily for July.

The Fullerton field was reduced 7357 barrels to 26,250 barrels daily. Wasson was cut 8159 barrels to 66,964 barrels daily. These reductions were expected to alleviate a critical pipe line situation in West Texas.

The commission's slash in July allowables came in face of higher allowables urged by operators attending the statewide hearing. What the purchasers wanted was more oil from fields where the oil could be moved.

The commission pointed out that a cut in East Texas in May had failed to arrest a decline in pressure, reported dropped 10.18 pounds during the month.

Synthetic Fuels Trial Plant Transfer Delayed

Announcement by the War Department that it intended to reopen all 15 wartime plants for the production of synthetic ammonia, including the Missouri Ordnance Works at Louisiana, Mo., recently transferred to the Interior Department for use as a demonstration plant in the synthetic fuels program, will not immediately affect the Bureau of Mines program but if the plant is continued in ammonia production for more than a year the bureau may have to look for other quarters. The idea of the War Department is to produce fertilizer materials for use in Germany and Japan, where better food supplies are badly needed.

Bureau officials explained that it will require about a year for the design work and initial construction on the demonstration plant. If synthetic ammonia production is discontinued at Louisiana by that time there will be no delay in the program, but if the situation still necessitates operations the bureau will have to look around for new quarters, involving a considerable loss in time and money.

California Standard Credit

Completion of arrangements for a $75 million bank credit was announced by Standard Oil Company of California. The plan becomes effective August 1, and will take the form of a revolving credit for the two-year period ending August 1, 1948, with options extended to the company to convert all or any part into a term loan for an additional 10 years, or into a term loan for an additional five years with a further option of renewal for a second 5-year period.

Batis Succeeds Strance

Harry Batis has been named chief supervisor of oil and gas by the Texas Railroad Commission, effective last week. He succeeds to the post vacated by C. W. Strance, who resigned to engage in the oil business.

For the past three and one-half years Batis has been on the commission staff in Austin, and for some time has been in the office of the chief supervisor. Before coming to the commission Batis held several administrative jobs in private business.

"Right to Work" Bill

The Louisiana Senate Committee on Capitol and Labor has approved the "right to work bill," which provides that membership in a labor union shall not be a condition for employment and forbids the signing of closed shop contracts at the expiration of present contracts. The House has already passed the bill.

Crude Oil Production in the United States

(Estimates compiled by THE OIL WEEKLY. All figures indicate daily averages in barrels.)

STATE OR DISTRICT	PRODUCTION IN WEEK ENDED June 22	June 15
Alabama	1,150	1,150
Arkansas	73,800	73,900
California	874,600	875,250*
Colorado	31,500	32,500
Florida	250	250
Illinois	207,600	207,400
Indiana	19,800	20,500
Kansas	277,450	282,900
Kentucky	30,500	31,000
Louisiana	377,450	377,150
North Louisiana	81,350	81,050
South Louisiana	296,100	296,100
Michigan	49,500	47,400
Mississippi	63,350	63,650
Missouri	100	100
Montana	20,900	19,350
Nebraska	750	750
New Mexico	98,850	98,850
New York	13,500	13,400
Ohio	8,100	7,500
Oklahoma	388,500	383,150
Pennsylvania	36,500	34,900
Tennessee	35	35
Texas	2,243,750	2,257,750
Tex. R. R. Comm. Districts:		
Dist. 1—S. Central	19,650	19,650
Dist. 2—Lower Gulf Coast	155,650	155,650
Dist. 3—Upper Gulf Coast	515,400	515,400
Dist. 4—S. West	229,600	229,600
Dist. 5—E. Central	43,950	43,950
Dist. 6—E. Texas Field	326,000	326,000
Dist. 6—Rest of N. East	107,350	107,350
Dist. 7-B—W. Central	32,400	32,400
Dist. 7-C—West	28,450	28,450
Dist. 8—West	566,450	580,450
Dist. 9—N. Central	132,400	132,400
Dist. 10—Panhandle	86,450	86,450
West Virginia	8,500	8,150
Wyoming	115,750	117,500*
Total United States	4,942,185	4,954,485*

* Revised.

Total stocks, foreign and domestic, June 15, as reported by the Bureau of Mines were 220,106,000 barrels with a daily average production of 4,961,000 barrels and runs to stills 4,799,000 barrels.

German Petroleum Output Shows Increase for March

German petroleum production in March totaled 57,300 metric tons (401,000 barrels, an increase of nearly 12 percent over February, it was disclosed last week in a report of the military government on the condition of German industry.

Practically all of the production is in the British zone, where extensive drilling has been under way in existing oil fields with the result that the daily average production rose to 1848 tons (12,900 barrels) in March, an increase of 6 percent for the month.

Most of the shipments from the British zone went to building up working stocks against a recurrence of fuel droughts which were frequent during the winter, and in the face of sharply reduced receipts of liquid fuel from that zone, allocations in the U. S. zone continued to be met increasingly from Army stocks, the report said.

A brief reference to oil in a report from the military government in Japan showed that production of refined products is rising in proportion to improvements made in the transportation of crude, but no figures were given on output.

The report disclosed that in April the Japanese government was ordered to prepare 10,000 metric tons of crude rubber for export.

Gas Sales Tax Defeated

The Louisiana House of Representatives failed by two votes to pass a bill, which originally called for a three-cent sales tax per 1000 cubic feet on natural gas, but which was amended before the vote to two cents.

THE OIL MAN'S CALENDAR

JUNE	
25–26	**Postponed Meeting, API Board of Directors, Dallas, Adolphus Hotel.**
27–28	**Pennsylvania Grade Crude Oil Association, Annual Meeting, Pittsburgh, William Penn Hotel.**
AUG.	
8–9–10	**Interstate Oil Compact Commission, Quarterly Meeting, Grand Rapids, Michigan, Pantlind Hotel.**
Sept.	
16–18	**AIME World Conference on Mineral Resources, New York, Waldorf-Astoria Hotel.**
OCT.	
1– 2	**American Association of Oilwell Drilling Contractors, Annual Meeting, San Antonio, Plaza Hotel.**
3– 5	**AIME, Petroleum Division, Annual Meeting, Galveston, Hotel Galvez.**
7–12	**American Gas Association, Annual Convention, Atlantic City, N.J.**
16–18	**Texas Mid-Continent Oil and Gas Association, Houston, Rice Hotel.**
24–25	**AIME, Petroleum Division, Annual Meeting, Los Angeles, Ambassador Hotel.**
28–30	**Independent Petroleum Association of America, Annual Meeting, Fort Worth.**
NOV.	
11–14	**American Petroleum Institute, Annual Meeting, Chicago, Stevens Hotel.**
21–23	**Rocky Mountain Oil and Gas Association, Annual Meeting, Denver, Shirley-Savoy Hotel.**

Report Discusses Government Premium For Wildcatting, Reserves Acquisition

Official encouragement of increased wildcatting through a premium price for new production, government participation in drilling or by guaranties of profits to wildcatters was suggested to Congress last week by the Tariff Commission in a report on the effect of the war on petroleum.

Tied in with such incentive program, the commission said, might be government acquisitions of already developed properties, to be held in reserve for emergency use.

The report also discusses the status of the industry in more than 30 foreign countries, emphasizing the importance of a few large oil companies in world petroleum affairs.

Although it reached no formal conclusions and made no outright recommendations, the commission did take a look into the future, coming up with suggestions for wildcatting aids and stressing the need for adoption of a tariff policy.

It pointed out that while the tariff on oil before the war had little effect upon domestic price because of the fact that exports were heavy and had to compete with foreign oil in world markets without the benefit of a dual price system, the situation may be materially different in the future, and, if domestic production should lag behind demand, the price of domestic oil might exceed foreign prices by an amount approaching the full duty in effect. In that case, exports would be confined mainly to specialties such as lubricating oils and aviation gasoline, and would be smaller than imports.

"The question whether or how far the price of domestic crude should now, or at any given future time, be maintained, by duties or quota restrictions, above that of foreign crude is a matter of policy to be determined by the Congress," it commented.

Closely connected with the problem of international trade is that of the protection of the national security as regards petroleum supplies against possible future emergency, the report warned.

"The extent of wildcatting in the postwar period, say between 1950 and 1955, will depend on the opinions of oil men not only concerning the prospects for discoveries but concerning probable financial results," it said.

"It is impossible to forecast the course of prices of crude petroleum in the United States in the longer term postwar period. Hitherto, the price of domestic crude oil has been determined substantially by the relation between current domestic production and domestic demand. The United States price thus has been affected only slightly, if at all, by imports. In the future, however, if imports should come to supply a much larger proportion of domestic consumption, the United States price at seaboard might tend to accommodate itself to the foreign price plus duty and other charges."

Search for Oil

Regarding encouragement for the search for oil, the commission said: "On the one hand, it may be argued that both national security in the event of a future war and the long-term economic welfare of the country make it desirable to retain large reserves of petroleum in the ground, and that consequently it would be wise policy to rely upon imports to furnish a considerable part of current needs if moderate prices should fail to bring out adequate domestic supplies. On the other hand, it may be argued that possible future changes in the sources of heat and power and in methods of utilizing them might ultimately deprive reserves of petroleum of much of their value, and that it would therefore be wiser not to be niggardly in their current utilization. Since the long-time future in these respects cannot be forecast with any certainty, a rational policy might perhaps be one intermediate between these two extremes."

The commission said it would be possible for the federal government to encourage wildcatting by:

1. Assuring, for a certain period of time, a premium price for oil from newly discovered pools and fields, just as during the war a premium was paid for increased production of certain metals;

2. Government participation (through loans or joint stock ownership) with private operators in the cost of drilling wildcat wells, or even by direct drilling of some of the wells entirely at government expense;

2. Guaranties minimizing the possible losses of wildcatters or even assuring them a limited profit.

Problems Cited

"Any of these methods, particularly the second and third, involve technical difficulties," the report said. "It would be necessary to guard against inadequacy of incentive, and against unreasonable burdens on the government and unreasonable profits to the drillers. Contracts between the government and private concerns would presumably have to vary according to conditions of time and place, and to be flexible in form, permitting reasonable adjustment according to the results.

The commission also suggested the possibility of the government, by negotiations with existing owners or by eminent-domain procedure, to acquire, for national reserves, pools or parts of pools already opened up.

However, it pointed out, the utility of any government-owned reserves in the ground will depend largely on the rapidity with which production can be started in case of an emergency. The Elk Hills reserve proved of appreciable value during the war, even though its development was long delayed.

The quickest possible results could be achieved if a considerable number of wells were drilled in advance and then shut in, Congress was told. Otherwise equipment should be available for the prompt sinking of wells as needed.

Acquisition of underground reserves might be coordinated with measures for government encouragement of wildcatting, the commission said.

SWPC Says Big Companies Increase Domination of Oil

Eighteen major companies which before the war had a "firm and comprehensive" control of the petroleum industry had an "even more dominating" one by the end of the conflict, it was declared in a report on wartime economic concentration submitted to the Senate Small Business Committee by the Smaller War Plants Corporation. Nearly 80 percent of the new refining facilities constructed at a cost of nearly $1 billion were owned or operated by the 18 companies, SWPC declared.

Seventy percent of the new facilities are privately owned by the companies, the report said and "whether financed privately or federally (through RFC loans or supply contract advances) these privately-owned facilities are now fully paid for out of huge wartime profits and contractual allowances and are completely amortized."

The SWPC's list includes The Atlantic Refining Company, Cities Service Company, Continental Oil Company, Gulf Oil Corporation, Phillips Petroleum Company, Pure Oil Company, Richfield Oil Corporation, Shell Union Oil Corporation, Sinclair Oil Corporation, Socony Vacuum Oil Company, Standard Oil Companies of California, Indiana, New Jersey and Ohio, Sun Oil Company, The Texas Company, Tide Water Associated Oil Company and Union Oil Company of California.

The new capacity consists almost exclusively of catalytic cracking facilities, the report said.

The closing of the two Big Inch pipe lines was a blow to the independent oil interests, the SWPC declared. These two lines, it pointed out, could conceivably break the virtually complete control of the majors over transportation.

Trade Experts to Moscow

Two trade experts of the Department of Commerce have left for Moscow to discuss means of increasing trade between the United States and the Soviet Union.

E. C. Ropes, Russian policy specialist, and Dr. Lewis L. Lorwin, staff economist, of the Office of World Trade Promotion will discuss with Russian officials the new peacetime operations of Amtorg and methods of further facilitating trade.

Included probably will be a discussion of oil, for the production and refining of which the Soviet needs large amounts of equipment.

Natural Gas Urges CPA to Increase Steel Supply to Pipe Manufacturers

Concerned over the shortage of line pipe, which is holding up expansions of natural gas facilities, a delegation representing the Independent Natural Gas Association last week asked John D. Small, Civilian Production Administrator, for an increase in the allocation of steel granted pipe manufacturers.

The committee, composed of Joseph Bowes, president of Oklahoma Natural Gas Company; B. R. Bay, president of Northern Natural Gas Company, and E. Buddrus, president of Panhandle Eastern Pipe Line Company, got from Small a promise to go into the matter. He gave no indication as to any action.

The association, in a resolution, pointed out that manufacturers of pipeline pipe are unable to make delivery, because of the shortage of steel, "until late 1947 or 1948," unless the allocation of steel to them is increased in a quantity sufficient to permit the full operation of existing mills and the installation of additional facilities.

Officials of several gas companies told THE OIL WEEKLY that the materials situation is causing grave concern and threatens to make impossible the construction of major facilities which are scheduled for completion before the onset of the next heating season.

Montana Line Proposed

The Federal Power Commission has scheduled a hearing for July 1 at Minneapolis on the application of the Montana-Dakota Utilities Company for authorization to build 28.5 miles of 10¾-inch transmission pipe line in Valley County, Montana, at a cost between $250,000 and $300,000.

The proposed line will parallel an existing 8-inch line and is for the purpose of transporting additional gas for distribution in communities served by the company and for the movement of gas from Bowdoin field during summer and off-peak periods for repressuring and storing in the Bake-Glendive field for withdrawal during periods of heavy demand.

West Texas Line Opens

Texas-New Mexico Pipe Line Company has placed in operation 6 miles of 6-inch crude oil line from its Crane Station to the Block 31 field in eastern Crane County, West Texas. The company will segregate the sweet crude produced in the field.

Wesson Outlet Ready

Root Refining Company has completed its 19-mile, 4-inch crude line that extends from the Wesson 23-well field, Ouachita County, Arkansas, to Junction Point on its Shuler-El Dorado 6-inch carrier. The field is prorated to 2100 barrels daily.

Stanolind Line Will Give Terry County Pool Outlet

Stanolind Pipe Line Company is completing construction work on a 35-mile, 16-inch extension of its West Texas-Oklahoma trunk line from the Slaughter field to its Wasson field booster station. The company's crude runs from the nearby Jones Ranch, Waples Platter and Ownby fields will be diverted to this extension instead of being exchanged for Slaughter field crude of other companies.

Stanolind has authorized the construction of a 3-mile, 4-inch lateral from the Slaughter-Wasson unit to connect with the Alex 4-well pool, Terry County. The field has not been produced for the lack of a market outlet.

July 1 Completion Date For Falls City Pipe Line

Southern Pipe Line Company's 30-mile, 6-inch crude oil line from the Falls City field, Karnes County, Texas, to Pettus, Bee County, is expected to be completed by July 1. The line will deliver the oil to Humble Pipe Line Company's line at Pettus. This is the first pipe line outlet for the Falls City field.

Standish Building Line

Standish Pipe Line Company, crude gathering subsidiary of Phillips Petroleum Company, is building a 1½ mile, 4-inch extension from its system in the Embar and West Andrews fields, Andrews County, West Texas, to connect with leases operated by Kewanee Oil Company and The Atlantic Refining Company.

This activity competes with Humble Pipe Line Company, which recently enlarged its gathering facilities to serve the north end of West Andrews field as well as the Three-Bar and Martin fields.

Phillips and Atlantic have joint operations in the adjacent Martin 3-pay deep area, and these properties may also be connected. All Andrews County crude gatherings by Standish are pumped to the Goldsmith field, Ector County, where deliveries are made to the Gulf Refining Company.

Rumor Ties Products Line With Venezuelan Output

Unconfirmed rumors reached Washington last week that an unidentified organization was planning to put in a bid for the Little Big Inch pipe line, tenders for the purchase or lease of which will be opened by the War Assets Corporation July 31, with a view to using it to transport gasoline from Venezuela to states along the southern half of its course.

The report could not be confirmed at the WAA, but in industry circles there was some concern, although it was pointed out that the use of the line for such a purpose would involve a very large investment in tankers, receiving facilities on the Gulf Coast and in the line itself.

Such a project, it was said, would disrupt refinery and marketing conditions far beyond the immediate area to be served.

The report did not state how the 200,000-barrel pipe line would be supplied, but it was pointed out that that much gasoline would require the refining of close to 600,000 barrels of crude daily and THE WORLD OIL ATLAS shows Venezuela has a current total refining capacity of only 108,900 barrels daily. Apparently, it was suggested, if the line was to operate near capacity it would be necessary to move domestic product as well as imported.

No Further Protest About Texas Gas Export Planned

Texas Railroad Commission Chairman Olin Culberson announced last week that he will make no further protest to the permit which was granted Reynosa Pipe Line Company for the transportation and sale of Texas gas to a Mexican corporation in Monterrey. Two of the Commissioners had opposed the granting of this permit by the FPC.

1946 Construction Prospects

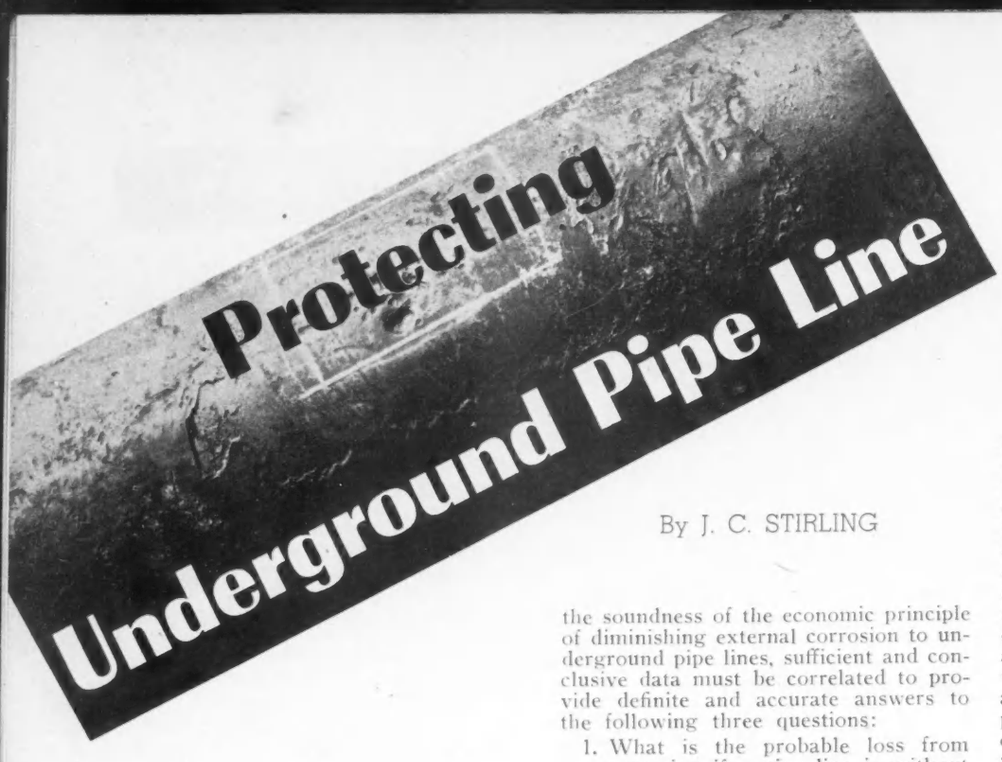
Under normal construction conditions, pipe line construction in the United States during 1946 would reach an all-time peak.

At the present time, pipe line projects, either completed, under construction or planned, total 10,317 miles and under normal operating conditions about three-fourths of this mileage would be completed during the year. This would place total mileage completed during a single year above the record of 7671 miles placed in operation in 1943.

However, shortages of pipe and other equipment, caused by strikes in the steel and coal industries, will likely keep the total mileage placed in operation during 1946 under the 5000-mile mark.

So far during 1946, approximately 1479 miles of new pipe lines have been completed. This includes 1097 miles of crude oil lines, 332 miles of gas lines and 50 miles of products carriers. Total mileage under construction is about 2675 miles, including 141 miles for crude oil, 1727 miles for gas and 807 miles for products.

Pipe lines planned, including those announced by companies and applications filed with the Federal Power Commission, total 6163 miles. It is uncertain whether any of this mileage will be under construction before the end of 1946. These projects include 1140 miles of oil lines, 4849 miles of gas lines and 174 miles of products lines.



Protecting Underground Pipe Line

Successful methods for economically combating external corrosion of underground pipe lines

By J. C. STIRLING

AMONG the most important problems to be overcome in the successful operation of a pipe line are (1) Those involving the mitigation of external corrosion of underground pipe lines; (2) minimizing of losses which result from the effects of corrosion.

Unless the first problem is controlled, the second presents an insurmountable obstacle. The effects cannot be minimized unless the cause is controlled. The following paper is prepared to show dangers inherent in a policy that fails to take adequate precautions against pipe line corrosion, the "enemy that works unseen."

Companies engaged in the transportation of crude oil, refined products, and natural gas lines will have spent, by the end of 1946, an estimated $3,900,000,000 in constructing some 400,000 miles of pipe lines which will provide the United States with an underground transportation system unequalled in the world. The first crude oil pipe line was laid in 1865, the first gas line in 1876, and the first products line in 1930. Turmoil and opposition were not uncommon ocurrences in the early stages of the pipe line industry, but the sound economic principles of pipelining perforce overcame all obstacles and in a comparatively short period the industry established itself as an integral part of the oil business. Thirty years ago there were less than 60,000 miles of pipe lines. Today there are approximately 150,000 miles of pipe lines carrying crude oil and refined products; also, approximately 250,000 miles of natural gas lines. In addition to the lines carrying crude oil, refined products, and natural gas, there are more than 200,000 miles of water pipe lines. This vast system of underground pipe lines which serves virtually every city and industrial center of the country suffers an annual estimated loss of $50 million as a result of corrosion. Conflicting opinions have been expressed as to the value of corrosion mitigation. In order to establish the soundness of the economic principle of diminishing external corrosion to underground pipe lines, sufficient and conclusive data must be correlated to provide definite and accurate answers to the following three questions:

1. What is the probable loss from corrosion if a pipe line is without any type of protection?
2. What is the probable loss from corrosion on the same pipe line if it has protection?
3. What would be the cost of pipe line protection?

Rather than expatiate in a technical way, this paper will attempt to discuss the subject in a simple, clear manner and endeavor to demonstrate that these answers can be obtained by the application of some experience, knowledge, common sense, and sound judgment.

It should be understood that all phases of pipe line protection, corrosion mitigation, and control must be included if an underground pipe line is to be adequately protected against external corrosion. Protection against corrosion cannot be acquired without cost and it should be considered as an investment or insurance, not as a speculation. An investment in pipe line protection for corrosion mitigation, upon which the success and life of a larger investment in the pipe line itself may depend, is worthy of close scrutiny.

Corrosion Loss

The probable loss to be expected from external corrosion depends on two factors:

1. How frequently leaks will occur. It is not enough to say leaks will occur. An intelligent analysis must be made as to their frequency.
2. What will the loss amount to when a leak occurs? As an example, the average direct labor cost to Company "A" was $160 per leak on 10-inch and 12-inch lines over a 2½ year period. This did not include cost of pipe for replacement or damages to the property. The probable direct loss of oil is usually easy to determine. The amount of damages to crops, stock, lands, and improvements is readily arrived at by appraisal; however, considerable difficulty is usually experienced when attempting to estimate damages to water supplies, irrigation ditches, and similar projects. The list of probable damages could be almost unlimited.

Exposures frequently are overlooked in estimating the importance of possible leaks. Consider two similar leaks. One occurs in an open pasture with nothing of important value nearby. Direct loss in this case would be limited to the cost of repairs, local damages, and the loss of oil. Should the other leak occur in a creek from which drainage enters the domestic water supply of a city, town, or community, the damage would probably be great and likely cause inconvenience to many and engender ill will against the offending company. In appraising these two areas for the purpose of estimating justifiable pipe line protection, it is obvious that the value of exposure in the second case would be of vital importance, and the cost of protection which may be entirely proper for the second would be unreasonable for the first.

Good will is a valuable asset and, although intangible, it is often a large item of expense. Serious public damages may create ill will and are apt to result in demands for extreme and costly settlements. Such payments are highly variable but must be considered in the final analysis of losses. Two extreme cases concerned with leaks cost a company $20,000 each. Serious exposures may result from oil leaks and although insurance companies foot the bills, the oil and utilities companies meet the increased insurance rates.

The aggregate loss should also include loss of pumpings or revenue which may occur as a result of station shutdowns caused by a leak. The physical loss created by the leak might be small but its influence on operations might be great. Estimates of such losses should include the time necessary to restore the line to operation, and pumpings which are lost during shutdown.

Company "A," Case 1: In 1923 Company "A" laid a pipe line from Teapot Dome, Wyo., to Freeman, Mo., a distance of 715.68 miles. This system included the following pipe: 78.86 miles of eight-inch screw end lapweld 28.55 pounds per foot, 322 mils wall thickness; 211.03 miles of 10-inch screw end lapweld 40.48 pounds per foot, 365 mils wall thickness; and 465.22 miles of 12-inch screw end lapweld 49.56 pounds per foot, 375 mils wall thickness, which makes a total of 755.11 miles of pipe. Along three sections of the right-of-way two parallel eight-inch lines were laid which accounts for the mileage of pipe exceeding the length of the line.

At the time the line was laid, approximately 710 miles of pipe were given a single coat of bitumen without a wrapper. The remaining 45 miles were coated and wrapped. Of the 45 miles, 19 miles were wrapped with a heavy hair felt, and 26 miles with 15-pound asbestos felt.

The line was operated as an oil line for several years. Then that section

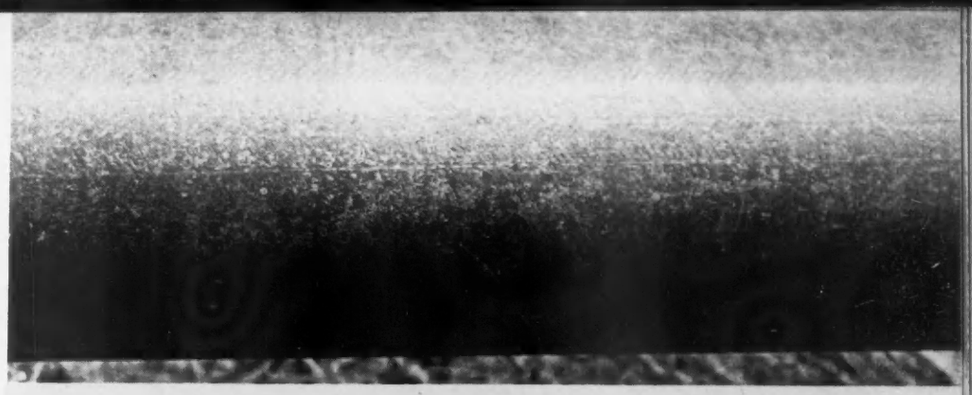
from Welch Station near Glenrock, Wyo., to Lawrence, Kansas, was used for transporting natural gas. During the 13 years that the line had been in the ground it developed many pit leaks and sections of it were so poor that great quantities of natural gas were lost through the pit holes. On a 40-mile section the gas company estimated that 90 percent of the gas placed in the line was lost. Early in 1936 owners of the line decided to move storage oil from Welch, Wyo., to Freeman, Mo., thence to refineries. In order to do this, it was necessary to rehabilitate the pipe line and stations. Realizing the line was in such a poor physical condition that it could not be used for transporting oil, the company completed plans for reconditioning sections of it. The areas of known leaks, the presence of salt or buffalo grass, marshes, road crossings, and other doubtful areas were used as a guide for the inspection of the line. In areas where inspections revealed corroded pipe, the line was taken up each way from that area until good pipe was reached.

Benefit of Wrapping

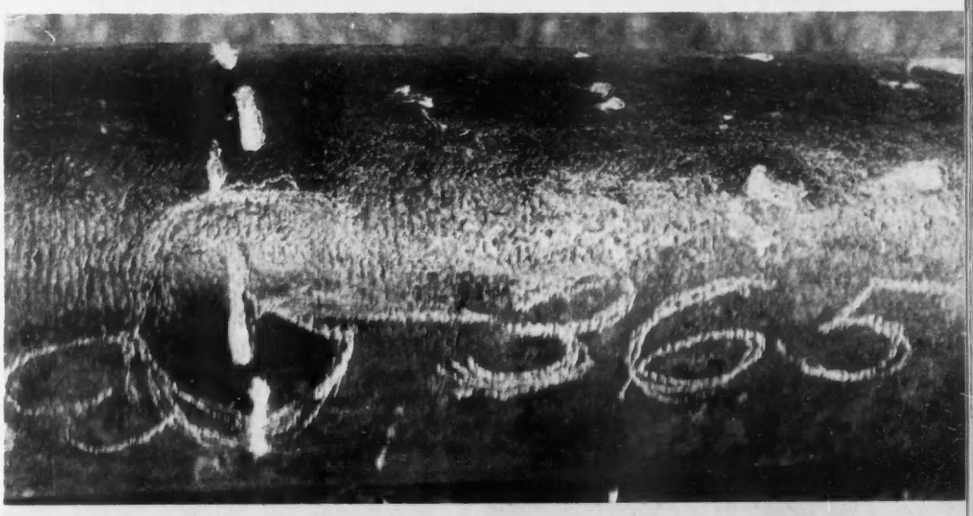
Of the 45 miles of pipe wrapped when the line was laid, approximately 15 miles were taken up. This pipe was taken up, not because of its poor physical condition, but because it was necessary to move it from highway and restricted areas to a new right-of-way. Very few pit holes were found in these 15 miles of pipe. The majority of the pits bore definite evidence that they were the result of holidays, improperly applied coating, or abuse in handling. It was observed that pipe coated with bitumen and asbestos felt was in excellent condition, while adjacent to the wrapped pipe there was unwrapped pipe which was almost beyond recovery, as many joints had 15 to 18 penetrations.

A total of 159.11 miles, or approximately 21 percent of the total pipe laid, was taken up, reconditioned in central yards, and relaid. Records of pipe classified in the cleaning and reconditioning yards revealed there were 4018 penetrations or pit holes through the pipe wall. The total cost of reconditioning the 159.11 miles of pipe was $1,262,000, which is equivalent to $1.50 per foot. If reconditioning cost of $1.50 per foot were spread over the entire line that was not wrapped when laid, it would be equivalent to $.3366 per foot, which was sufficient money at that time to apply adequate protection to the line, install cathodic protection, and meet electrical power costs for several years.

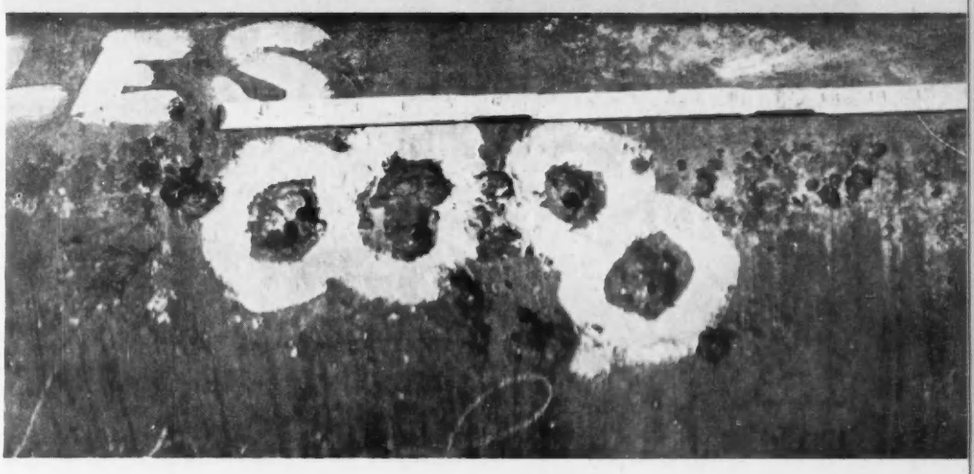
Realizing that steel will suffer deterioration when in contact with corrosive soils makes it obligatory to coat any pipe laid along the right-of-way of this line. The use of pipe with sufficient wall thickness to withstand operating pressures without allowances for corrosion resistance would have permitted the saving of considerable tonnage of steel over the standard weight pipe that was used in the construction of this line. The use of coatings adequate to protect the pipe as shown heretofore could be offset by the cost of reconditioning the line. In addition, the coating would permit the use of thinner walled pipe. For comparison in this case, consider ¼-inch wall pipe. Pipe with ¼-inch wall could



Above: **Specimen of pipe buried 13 years; bitumen and wrapper (Case 11—Company "A").**
Below: **Pits resulting from rock depressions through wrapped coating.**



Above: **Result of handling coated pipe with a chain.**
Below: **Badly corroded pipe, after being cleaned. It was buried 13 years; coated with bitumen only.**



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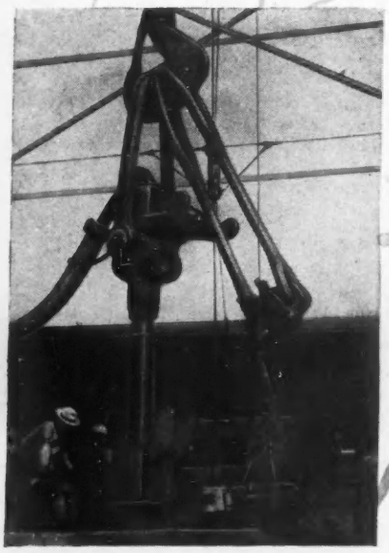

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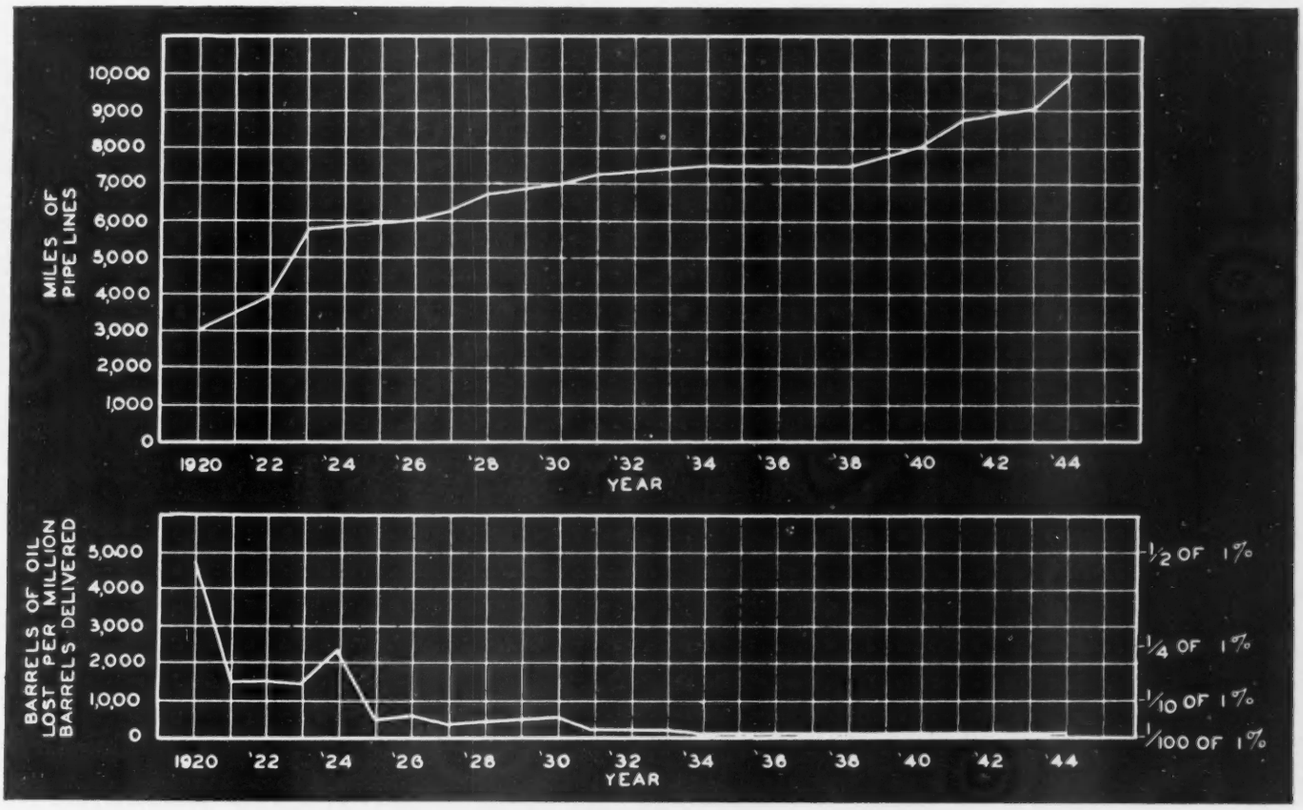


Company "A" chart showing miles of pipe lines and barrels of oil lost in a 25-year period.

be used in this system for working pressures of 1160 pounds on the 8-inch and 780 pounds on the 12-inch. The reduction in wall thickness from standard weight pipe to ¼-inch wall would have reduced the required tonnage of steel by 28,000 tons. The reduction of 28,000 tons at $84 a ton, which was the average cost of pipe strung on the line, would have resulted in a saving of $2,352,000. In other words, if the money spent in 1936 for reconditioning 159.11 miles of the line had been used for coating the line at the time it was laid, at the end of 13 years the line would have been in good physical condition and there would have been an estimated saving of $2,352,000 in steel alone. In addition to this saving, the construction cost would have been less, less damages would have resulted from leaks, and much ill will from tenants and landowners because of oil leaks would have been avoided.

Labor Saving

If the labor cost of $160 per leak as has been shown was used as a basis for calculations, it would have cost $643,000 in labor alone to have repaired the 4018 leaks that actually existed in the line. In some areas where several pits were close together the cost per leak would probably have been less than the $160 average; however, there were many cases where other conditions would result in the cost greatly exceeding the average. Add to this $643,000 the value of pipe necessary for replacement, the protective coating, and the property damage. The expenditure, if such a procedure had been followed, probably would have exceeded $1,262,000, the cost for taking up the pipe, reconditioning, relaying, and coating it.

At the time of reconditioning in 1936, several sections of the line were returned to the ground with a single coat of bitumen, as the economic life of those sections was supposed to be short. In the course of two or three years the economic status of those sections of the line changed from a temporary to a permanent nature. It was then necessary to recondition and wrap the line in those areas as the physical condition of the pipe became so bad the line could not be operated.

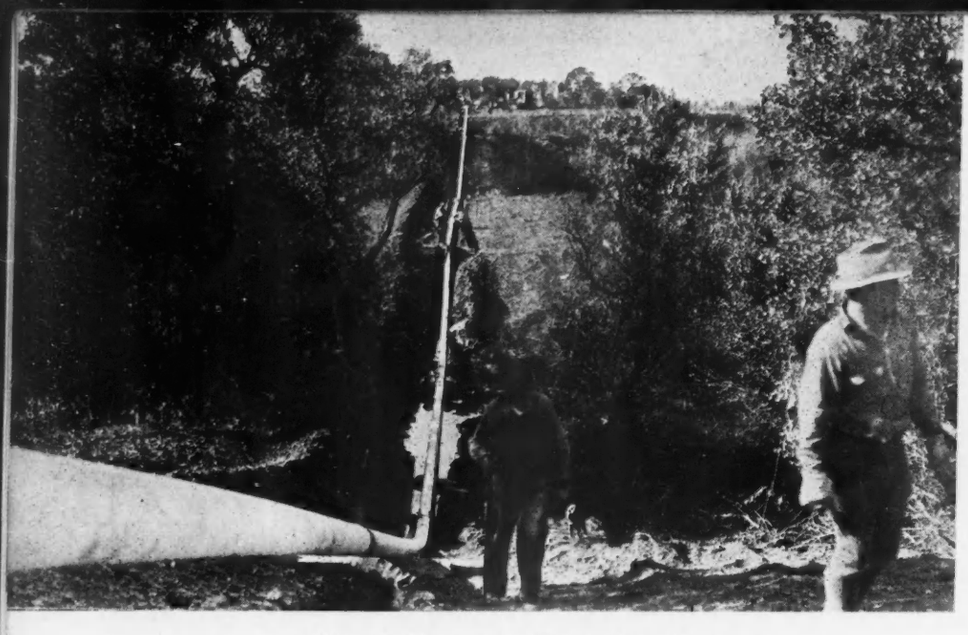
Company "A," Case 2: In March, 1944, Company "A" completed a 16-inch line from the Slaughter Pool in West Texas to Drumright, Okla., on which it saved 8573 tons of steel by using ¼-inch wall pipe through areas of low pressure in lieu of .284-inch wall pipe. The reduced steel tonnage effected a saving of $772,000 in the cost of the pipe. Wall thickness of .284-inch has been used in this case as a basis for calculations because it was the maximum thickness required for the operating pressure of the line.

Protective coating was applied to the entire line at a cost of approximately $963,000, and it is estimated that an additional $17,000 will install cathodic protection. The total cost of protective coating and cathodic protection would be approximately $980,000, which exceeds the actual saving by $208,000.

Two test installations, using welding machines as a source of power, revealed that one unit draining 25 amperes of current protected 66 miles of the 16-inch line. One test was made at each end of the line. These tests revealed that, provided power is available, right-of-way can be obtained, and soil structure is adaptable to installation of ground beds at the appropriate location of rectifier equipment, only five units will be needed to protect the entire line. However, because all these factors are not likely to exist in each of the desired locations, it probably will be necessary to install two additional units at irregular intervals in order to fully protect the line. Allowance has therefore been made for seven rectifier units, two of which, if installed, would be operated at reduced amperage. It is first planned to install five units, then check results. If it is found that two additional units are required, they would be added. The spread of protection on this line indicates an excellent coating. Power cost to protect the entire line is estimated at $1300 annually.

Should the line have been laid bare and the same policy followed as in Case 1, then the wall thickness in this line would have been .375-inch. The use of .250-inch wall pipe with coating would have effected a saving of 23,580 tons of steel valued at $2,122,200 strung on the line. Then the cost of protective coating plus the cost of cathodic protection would have effected an estimated $1,42,200 saving.

Company "A," Case 3: During 1944, Company "A" constructed approximately 232 miles of 12-inch pipe line from Elk Basin to Casper, Wyo., on which was used pipe having a minimum wall thickness required by pressures to be handled. By reducing the wall thickness from .375-inch (standard pipe) to the minimum required by the pressures, there resulted a saving in steel of 5240 tons valued at $470,600 strung on the line. This saving in steel is $200,000 more than the cost of protective coating that was applied to the entire line. It is estimated that $50,000 will cover



Hills and valleys present alternate dry and wet areas.

the cost of cathodic protection to the line.

Company "A," Case 4: In 1919, Company "A" laid 60 miles of eight-inch screw coupled pipe bare from Devol to Healdton, Okla. During 1925 and 1926 the entire line with the exception of 6¼ miles across two areas of lowland was raised, cleaned, and coated with bitumen and a hand-applied wrapper of asbestos felt. In 1932 and 1933 the pipe across the lowland was replaced. In 1940, short sections of pipe at various hot spots totaling 8900 feet and a six-mile section across creeks were replaced with welded, coated pipe.

Tests made show that this entire line can be cathodically protected for approximately $36,000, or only $600 per mile. It is particularly adapted to cathodic protection because it is coated. Even though the coating was applied in 1925 and 1926 when the methods were crude and workmen inexperienced, it would materially reduce the cost of cathodic protection by increasing the length of the line which could be protected by each unit.

This case is cited to show that even though the coating was applied poorly under adverse conditions and it has little value in eliminating pitting, it would materially reduce the cost of cathodic protection. The wall thickness of the pipe used in this line could have been reduced from .322-inch to .250-inch and the saving in steel would have been $90,000, which would have been $20,000 in excess of the estimated cost of a wrapped coating.

100 Percent Recovery

Company "B," Case 1: In 1926 and 1927 Company "B" laid 225 miles of eight-inch pipe between Kings Mill, Texas, and Ringling, Okla. The line was double-coated and double-wrapped at an estimated cost of $265,000, which is approximately $1180 per mile. The line was removed in 1942 and relaid from Corpus Christi to Damon Mound, Texas, as a feeder supply line for a 24-inch oil line, the "Big Inch," from Texas to the Eastern Seaboard. A large portion of the pipe was relaid with the original coating intact, which is an economy as the major coating erpense was for field joints, as would be the case with factory or yard coated pipe. It is claimed that the recovery of pipe from this line was near 100 percent. Reports show there was no culling, no measuring of pits, nor junk pipe to be disposed of; pipe was like new.

In view of the behavior of the coating on this line, having provided it with positive protection for 16 years, there is little doubt that the pipe could have been thin wall. The reduction of wall thickness from .322-inch to .250-inch would have effected a saving of 3700 tons of steel at an estimated value of $330,000 strung on the line. This saving in steel cost would be $65,000 greater than the cost of protective coating.

Company "B," Case 2: Company "B," during 1941, laid an uncoated eight-inch line between Casper and Welch, Wyo. A recent inspection of that line showed most of the pipe in low areas was pitted to some degree. One 2500-foot section was observed where the pitting was very severe and extended the full length of some joints. Many of these pits had penetrated more than half the pipe wall thickness. As this line had been laid only three years, the condition of the pipe indicated that many punctures will occur within the next three years. An adequate coating on the pipe similar to that applied on the line in Case 1 would have prevented severe corrosion, pemitted the use of thin wall pipe, thus effecting a substantial decrease in the required tonnage of steel, and as a result of greater inside diameter increased the pumping capacity of the line.

Company "C": Company "C," serving the Midwestern states, began its operations in 1930 by laying its lines bare. Seven years later when additional lines were laid, coating was applied to approximately 25 percent of the pipe. As a result of this company's experience with corrosion, it has decided to lay no more lines bare. The company's corrosion engineer has since stated that any lines built in the future will be solid-coated and with cathodic protection. Since the cost of applying cathodic protection to a well-coated line is usually quite nominal and only a small fraction of the overall construction investment, its use will be included in the pipe protective program.

Company "D": Company "D" installed its initial line in 1936 in Nebraska. It was originally coated with a single application of material and not wrapped. According to available information, seven miles of the line east of Cozad was taken up and reconditioned in the spring of 1938 because the physical condition of the pipe was so bad that the line could not be operated. When the pipe was replaced at the end of two years' service, it was again coated with one application of the same material and no wrapping. In 1940 some of the pipe was replaced a second time; however, on this occasion it was wrapped and no further trouble has been reported with this section of the line.

Other sections were laid without any protective coating, on which cathodic protection was later installed. Several sections of the bare line, even though it has cathodic protection, have deteriorated to the point where it is necessary to replace them. Some sections as long as ¼ mile have deteriorated to a critical condition. A large portion of this line is parallel and adjacent to the line described in Case 1 of Company "A," which was reconditioned in 1936 and coated with bitumen and asbestos felt. The line belonging to Company "A" is serving well; therefore, it is believed that if the line of Company "D" had been coated and wrapped it would be giving equally dependable service.

Seven Years' Service

Company "E": A company operating in California reports after seven years' service that examination of bitumen pipe coating revealed it was apparently unchanged since application. No leaks had been experienced on the line nor had it been necessary to apply cathodic protection.

Company "F": This company reports that since previous inspections had indicated a wholesale failure of the original hot enamel coating on an 18-inch line, it was agreed that an initial protective drainage of 1.5 to 2.0 milliamperes per square foot of pipe should be applied. When cathodic protection was applied it was discovered that the former appraisal of the coating proved pessimistic and the pipe responded to protection much better than expected.

The findings in this case bear out other observations that in many instances, even though a thin coating might furnish very little protection to the pipe against corrosion it is a valuable asset to the application of cathodic protection.

General

The reduction of the wall thickness of pipe increases the capacity of the pipe line as follows:

Size Inches	Nominal Thickness Standard Weight Pipe Inch	Thin Wall Inch	Line Capacity Increase Percent
8	.322	.250	5
10	.365	.250	6½
12	.375	.250	6
16	.375	.250	4½

Visualize what 6 percent means in increased capacity. It could mean the reduction of $300,000 or the laying of an additional 20 miles of 12-inch pipe on a $5 million project. This economy is to a great extent made possible by the use of adequate pipe line protection.

One engineer estimates that on pipe lines completed during 1941, his company participated in a saving of 35,000 tons of steel through the use of lighter weight pipe in conjunction with coating. This is more steel than is required to

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Pipe Line Contractors

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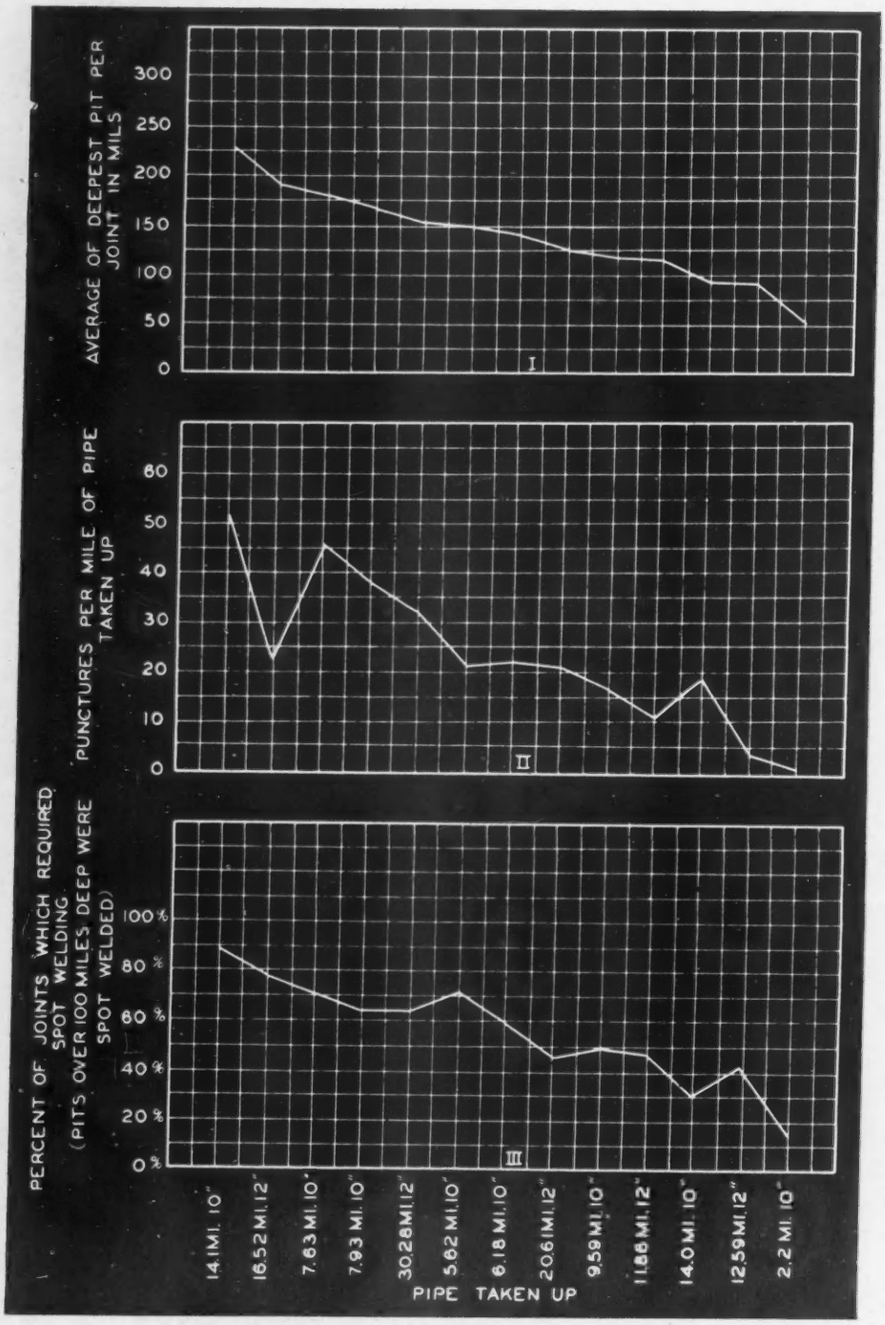


Company "A" Case 1 chart showing condition of pipe taken up from 159.11 miles of line (Pipe laid bare or with single coat of bitumen without wrapper).

build ten average-size cargo ships. His experience shows savings of steel as high as 33 percent through the reduction of pipe weights from those previously used under similar conditions.

The reclaiming of pipe from existing lines is of great importance. Without protective coatings and cathodic protection much of the used pipe would be worthless for relaying as the residual wall thickness is not sufficient to withstand corrosion.

Another engineer reported that, in recent instances involving the valuation of buried pipe to be taken up and relaid, full protected pipe received valuations 35 to 50 percent greater than bare or only partially protected pipe.

Protective coatings have been instrumental in the greatly increased use of steel pipe as the most practical material for water lines.

From the preceding information and data it appears without a reasonable doubt that protective coating is a real conservative measure. Having determined the pipe wall thickness required to withstand the operating pressure, the pipe line engineer must choose between buying additional thickness of steel to forestall failure from corrosion or buying protective coatings.

Soil Stress

The most destructive factor on coatings underground is probably soil stress. It is generally true that the thicker the coating the greater the efficiency and initial cost. However, the type of material is important. Very thin coatings are of little value as a protection to pipe against pitting; nevertheless, experience shows they aid materially in utilization of cathodic protection.

Tests reveal that some pipe coatings have high resistance after several years underground. One engineer reports that on a 3.5-mile section of 12¾-inch and 10¾-inch outside diameter pipe, the effective resistance of a coating after 2.75 years burial was 0.92 ohms, even though at the time of measurement an uncoated drain cock was known to be submerged in water. On a 3.5-mile section of 8⅝-inch od coated pipe, the effective resistance of the coating after two years service in the ground was .75 to 1.0 ohms per square foot. The effective resistance of a coating on 9.66 miles of 6⅝-inch od pipe measured after two years underground service, was found to be 6.5 ohms per square foot.

Reinforcements or shields, whether asbestos, cotton, or rag greatly improve the coating. Of these reinforcing materials asbestos appears to be the only one in common use today which is invulnerable to deterioration in the soil.

In evaluating areas for purposes of estimating justifiable pipe line protection, it is quite evident that the value of exposure in some areas would be of vital importance and the cost of extreme protection which may be entirely proper for them, out of reason for other areas.

Conclusions

As pointed out, the object of the preceding discussion has been to demonstrate that the answer to the question, "Is the mitigation of external corrosion to underground lines economical?" can be obtained by the application of knowledge, experience, common sense, and judgment. No theories have been advanced to account for the various types of corrosion, but an attempt has been made to show that successful methods are already employed in combating it.

Since there are successful methods for combating corrosion, they permit the designing engineer to use steel of a thickness necessary to care for the working pressure, plus a safety factor. It is no longer necessary to add steel to the required thickness of pipe to provide for the anticipated corrosion.

If required to design a pipe line for personal use, it would be laid with pipe of the required wall thickness to withstand the operating pressures, plus a factor of safety. A substantial coating, tested for holiday, would be applied to the entire line. After the line had been in the ground for six months, the coating would be checked for discontinuities. It is entirely feasible through demonstrated means and at slight cost to locate and repair discontinuities occasioned through the construction. Subsequent to the test for discontinuities of coating and repair of damaged areas, if additional protection were required, it would be obtained by cathodic means. A pipe line of this design would be the most economical one possible to construct, as the initial cost would be low and corrosion maintenance would be negligible.

Acknowledgment

The assistance of several engineers who furnished data is gratefully acknowledged; however, their names are withheld so their lines and other affiliations may not be identified.

Pipe Line Maintenance

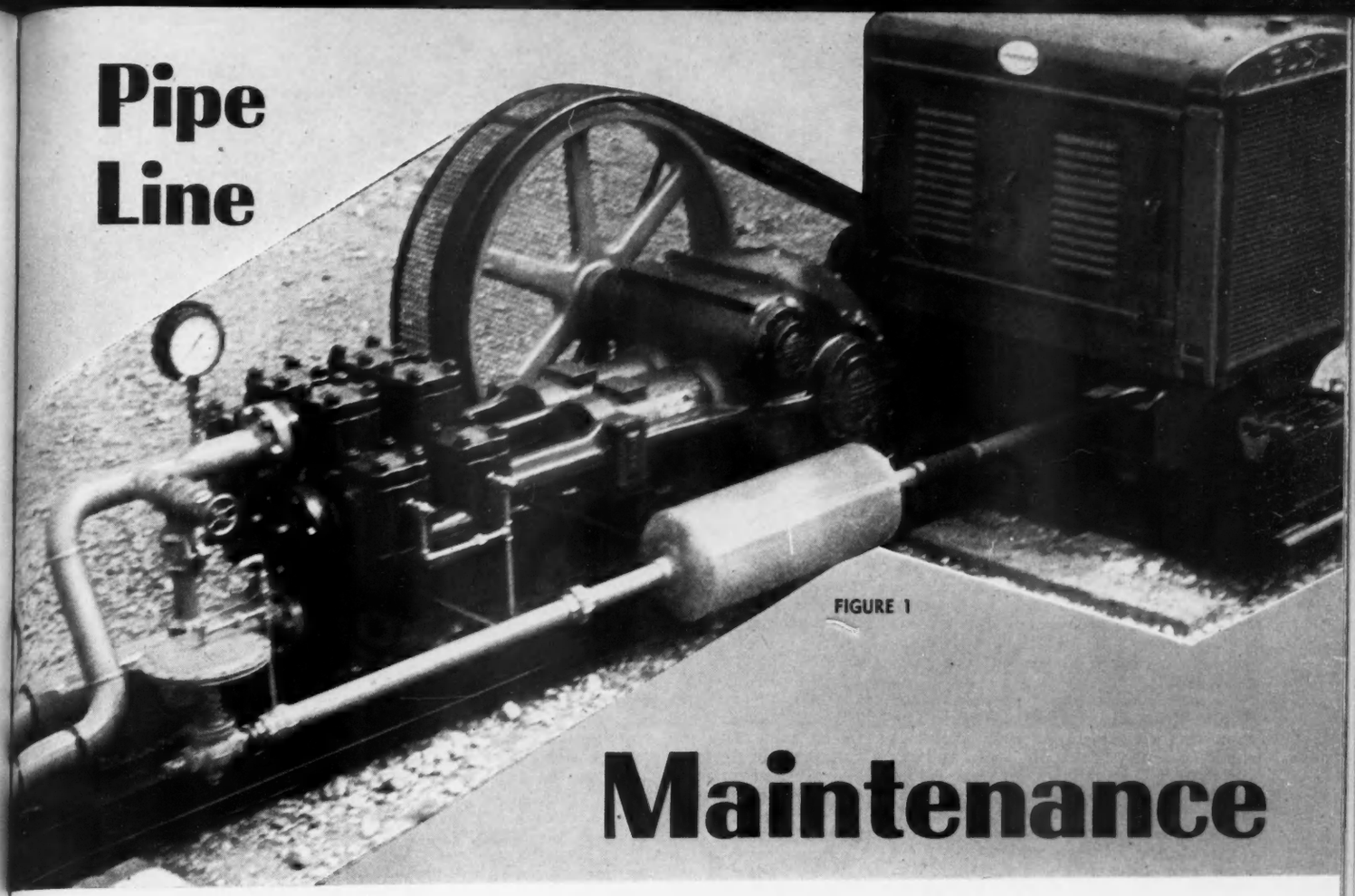


FIGURE 1

By FRANCIS CORYELL
Research Engineer, Interstate Oil Pipe Line Company

THE cost and maintenance of pipe lines and pipe line stations is a function, first, of their design. Design includes not only the selection of pipe of the proper diameter to meet the hydraulic requirements, but is concerned also with picking the correct pipe wall thickness and method of manufacture, methods used to lay the pipe, and the type of protective coating applied.

In pipe line station design, the type of machinery selected, and the operating speeds and loads are most important. The station auxiliaries, such as heat exchangers and lube oil filters, have an important bearing on maintenance, and while these are normally selected in the original design of the pipe line, fortunately they are subject to improvement from time to time as progress indicates.

The design and construction of a pipe line is usually completed in a few months, but maintenance begins on the day of operation and continues year after year, generally at an increasing tempo. Once maintenance has "set in," the question of the design is a "closed book," and the lessons in design that subsequently can be learned are of use only for future planning of other pipe lines.

Maintenance and Preparation

It is evident, then, that maintenance is a problem inversely proportional to the preparation that is made for it. For example, a new oil pipe line station equipped with new pumps, on the first day of operation develops "valve trouble." This may easily happen due to use of a brass valve seat not suited to high pressure service, or it may be that a hardened steel valve seat of excellent design has cracked in the hardening—an error in design in one case, and workmanship in the other. If no thought has been given to maintenance, the pump will be shut down until a new valve seat is secured. If the reader's natural reaction is that no one would think of putting a main line station in service without a few extra valves and valve seats on hand, then he will also agree that the ability to handle each maintenance problem is one of preparation—the stocking of sufficient material to make the necessary repairs, and then having properly trained men available to do the work.

We have now developed the three factors of maintenance, namely, design, material, and trained manpower. The first factor is settled when maintenance begins, but the other two are flexible and variable through the years. Sources of material must be established, and the more crucial an item is to maintenance, the more reliable must be the source of supply. This source need not necessarily be the stocks of a company's own warehouse. This, again, is determined by proper planning. To keep storehouse stocks within reasonable limits, requirements for each item of maintenance must be carefully considered to determine minimum quantities to be kept on hand at each station or field storehouse, and to balance against reliable outside sources of supply from which reserve stocks may be drawn. This can be done by weighing the cost of stocking items at each point of use against the cost of maintaining a central storehouse, or the dependability of the stocks of reliable supply houses.

Even with many items of supply difficult to secure, a satisfactory plan can be laid out in a relatively short time, but men capable of doing economical maintenance work are not so readily developed. Some jobs can, of course, be filled by unskilled labor. However, this is one of the pitfalls of maintenance, in that many employes are hired because they fulfill the immediate requirement of an unskilled helper, and do not have the inherent ability to rise to higher positions as their years of service increase.

Pipe Line Maintenance

Pipe line maintenance falls into the two distinct classifications—routine and emergency repairs. In most operations, the crews used for routine operations are also held responsible for emergency repairs and, consequently, must be equipped for both types of work. The most important factor in the planning of routine maintenance is the training of men in the proper "know how." Throughout the years, the amount of physical work required on pipe lines has been reduced, but there is still plenty of hard physical labor entailed. Progress has dictated that welded lines replace screwed lines, stronger and lighter forged steel welded fittings replace heavy cast iron screw fittings, and that a gas engine arc-welding machine in the back of the pickup replace the heavy hand-operated dies. All of these improvements have been brought about by careful

FIGURE 2

thinking, planning, and by cooperation between the theoretical designer and the practical men in the field.

The planning of work equipment for field repairs is a very critical item, because the efficiency of men is dependent on the tools they have to work with. If repair crews are constantly delayed by lack of material or broken equipment, their morale is reduced, and costs will rise.

Frequently, repair crews are required to travel long distances each day to and from their work, and work vehicles which effciently transport tools and repair materials usually make poor riding vehicles for a gang of men. In consequence, there are innumerable variations in the types of vehicles used for the transportation of men and tools. Field repair gangs are frequently required to spend most of their time away from headquarters, and the living conditions available, even though expensive, are sometimes rather poor. It is unfortunate that very little can be done to remedy this situation, because living conditions have an important bearing on the efficiency of the repair crew and the type of men who can be secured for maintenance operations.

Properly trained men and adequate equipment are the two dominating factors in routine pipe line repairs. The materials used in pipe line repairs are well standardized. In fact, the tendency of suppliers is to duplicate the products of their competitors, rather than to develop new ideas. For example, we originally used heavy cast iron clamps for pit hole temporary repairs. Then with the advent of electric welding, steel plate was substituted, using U-bolts and lightweight clamps to hold the plate in place until permanent repairs could be made.

Aerial Patrol

There has, however, been an improvement in the method of finding leaks and potential danger points on the pipe line, namely, aerial patrol. The development of aerial patrol has been particularly rapid since the end of the war, and its use becomes even more important with the availability of radio communication between the plane and ground facilities. This method of pipe line patrol is least expensive when flights can be arranged so that the pilot is not required to double back over the same right-of-way. If this can be done, the cost of aerial patrol should not exceed a fourth the cost of foot patrol.

During the past winter, a mild one, all routine flights were completed on a schedule covering several hundred miles in the Mid-Continent territory. During one four-month period which was surveyed, there were 164 items reported by the patrol plane. Half of these were leaks, and the other half, cases of exposed line, drift on lines in creek bottoms, and erosion conditions that needed checking.

Aerial patrol pays even greater dividends when a patrol plane is based at the center of a trunk pipe line system, so that emergency flights may be made quickly to any section of the pipe line where a sudden drop in pressure indicates a possible leak. In rough country, particularly, a patrol plane can be sent 100 miles to cover a section of line between two main line stations, and can complete the flight over the section more cheaply and quickly than it can be covered by a pipe line gang.

Emergency repairs of pipe lines also involve advance preparation in the way of men and materials. Very few things happen today that have not happened before, and while we cannot always anticipate when and where an emergency will strike, preparations can be made for the pipe line shut-down, calling for immediate action.

The spring floods of 1943 caused considerable damage to pipe lines, railroads, and highways in certain sections of Oklahoma. With transportation upset, the movement of repair materials became a problem. Fortunately, all the necessary equipment and materials needed could be moved to the river crossings that were in trouble, but the margin was too close for comfort. Steps were taken then to accumulate emergency equipment needed for repairs at a central point from which it was believed the highways would likely stay open during flood conditions. This emergency equipment, which is listed in part on the attached tabulation, has been maintained intact to date, although from time to time, certain items have been removed for use and replaced with new material so that there will be no deteriorations. Dry rot and shrinkage of wooden parts is, of course, the greatest worry.

The pontoons listed have proven in service to be too light for general use. They were designed for easy transportation and have been satisfactory for the movement of small amounts of pipe and material across flood waters, but are not big or heavy enough to carry heavy tractors and other weighty work equipment. It is sometimes necessary to move a heavy tractor or pulling machine across a flood section so that a temporary pipe line can be pulled across, and the pontoons should be large enough to perform this task.

Emergency Equipment

2—15 H.P. Outboard Motors
2—Complete Lists of Repair Parts for 16 H.P. Outboard Motor
2—Pontoons, Steel 5′ x 18′
1—14 Ft. All Metal Boat
3000—Ft. 7/8″ Wire Line
1500—Ft. 3/4″ Wire Line
1—4″ to 21″ Pipe Cutters
18—Large Life Preservers
30—Long Handle Shovels
20—"D" Handle Ditching Spades (Sharpshooters)
10—Mattocks
15—Picks
25—Pick or Mattock Handles
2—Hand Saws
6—2¾-Lb. Double Bit Axes
120—½″ to ⅞″ Wire Line Clamps
2—10-Gal. Water Coolers
2—16-Unit All-Weather First Aid Kits
275—Ft. 1½″ Manila Rope
700—Ft. 1¼″ Manila Rope
100—Ft. 1″ Manila Rope
2—5½-Ft. Cross Cut Saws
1—Model 68 Onan Light Plant, 110 Volt, 650 Watt, D. C.
1—2″ Model 10-M Sterling Pumping Unit
2—AG-18 American Auto Electric Portable Telephone Sets
5—14″x1½″x1¼″ Snatch Blocks
Miscellaneous—Mechanics' tools including wrenches, hammers, chisels, pliers, etcetera.

Field Gathering

One of the most active phases of the pipe line business is the gathering of oil. The equipment used for this purpose is generally supplemented from time to time, and there is always an opportunity to improve design. Also, a great variety of equipment is offered, and the designer can pick and choose that which will serve most efficiently for his application. Maintenance is largely determined by the care used in the selection of equipment, particularly the engine. The natural tendency is to overload and overspeed the engine. Emphasis in the postwar sales market is being placed on the use of higher piston speeds. The old standard of 1000 feet per minute, which had begun to give way before the war, is now being pushed towards 1400 and 1500 feet per minute. Perhaps we do have much better materials now than ever before, but the greatest advantage will not be in jumping to higher ratings, but in promulgating lower maintenance costs through continued conservative use of the equipment incorporating the various improvements offered.

In addition to selecting the most efficient engine and pump, the designer can incorporate several devices in his layout to greatly improve operations and reduce maintenance.

Vacuum Gauge Use

The use of a vacuum gauge connected to the intake manifold on a multicylinder, high speed gas engine is most important. This type gauge is as vital to the pumping unit as a stethoscope is to a doctor. It indicates immediately the load on the engine, and reflects other conditions, such as improper engine timing and poor curburetion. It informs the experienced operator when his engine or pump has developed a mechanical defect. For example, a burned exhaust valve in the engine will show a decreased vacuum, because the engine efficiency has dropped, while a suction valve stuck open on the pump will show an increased vacuum, because the load on the engine has decreased.

The use of high water temperature and low oil pressure safety switches,

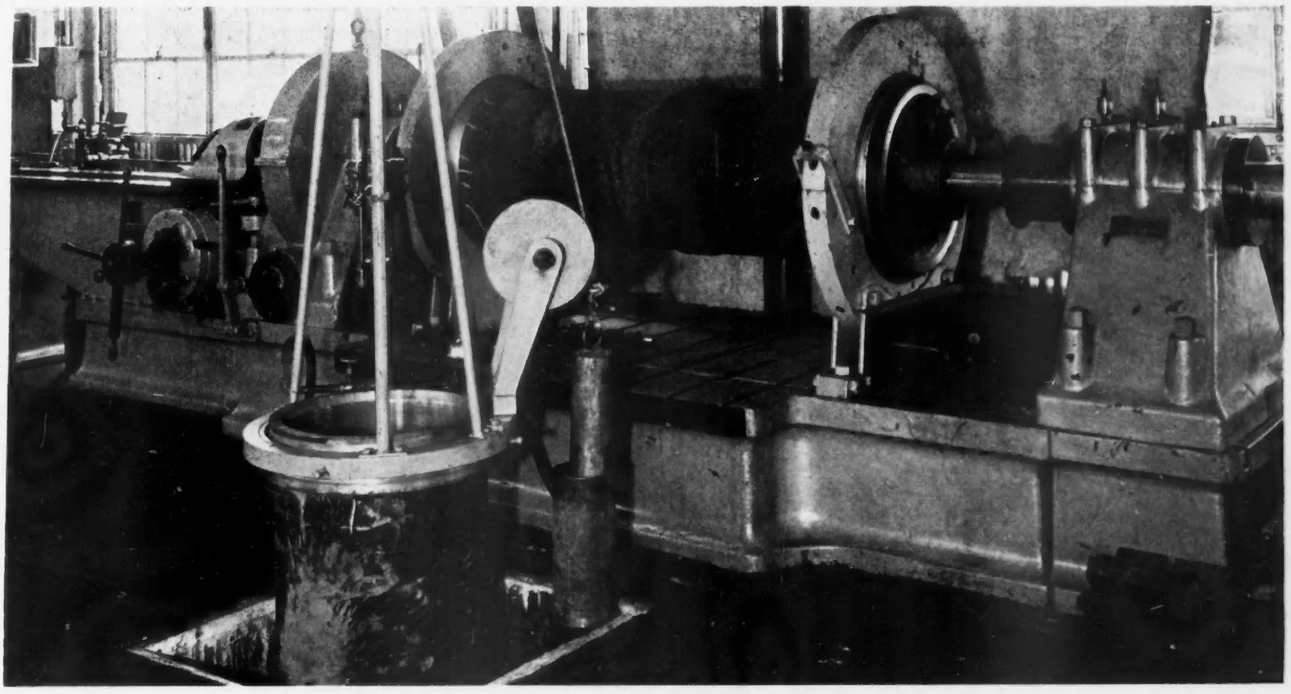


FIGURE 3

when properly selected and installed, will also reduce maintenance, since they prevent expensive accidents. Oversize lubricating oil filters help to keep the oil clean longer, and clean oil contributes to lower maintenance costs. For the protection of the pump, a relief valve should be provided so that if in the process of opening and closing the numerous valves usually found in a gathering field, the wrong valve is closed, the pump will not be damaged. The pump should be equipped with a pressure gauge on the discharge line and also a combination pressure and vacuum gauge on the suction line. Most pumps are equipped with pressure gauges, but frequently the gauging on the suction line is omitted. As a result, the pump is condemned for not pumping its rated capacity when actually it is not built to operate with a vacuum on the suction line. This is particularly true when small liners are used in a gathering pump, because small liners indicate higher pressures and few pumps will pull vacuum and pump against high discharge pressures at the same time.

All these are design factors, and Figure 1 shows a pumping unit built up with all these features incorporated. Upon delivery to location, it requires only connection of the oil suction line, oil discharge line, and natural gas fuel line, before being placed into operation.

Figure 2 shows a truck and trailer, loaded with two pumps and four engines, ready for delivery to the field.

Maintenance of field gathering units, whether backed by an aggressive design program or "just bought," is again a function of material and manpower. If there are trained field mechanics to keep the units in proper condition, the time between major overhauls is greatly extended.

As an example of reducing station maintenance costs through planning, it is apt to cite the experience of one pipe line company that was fortunate enough to have a large number of engines using the same size cylinders and pistons. In fact, there were 82 cylinders operating 24 hours a day at the time the development was started in 1930. At that time, a few of the engines were 15 years old and the majority were seven to eight years old. Today, practically all of these engines are still in operation and the question of cylinder liners and pistons has long ceased to be a maintenance problem.

In order to economize, some of the cylinder liners were being rebored to an oversize, and new pistons were purchased to match. The first step was to determine the proper undersize so that the standard pistons might be used as well. When the program was put in full swing, only undersize liners and oversize pistons were purchased new. Each liner and piston was thus used three times, as the machine shop was equipped to turn the used oversize pistons to standard, and then years later to undersize, as well as rebore the used undersize cylinder liners to standard and again years later to oversize.

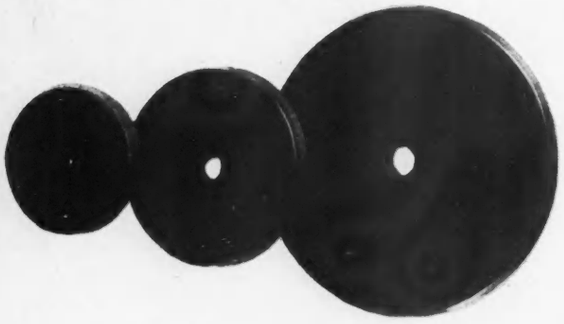
Figure 3 shows a boring mill, built especially for the job of reboring cylinder liners. The normal feed of this machine is only 60 inches, whereas the liner is 70 inches long. A special feed end and boring bar give 72-inch bar travel without resetting the tool. A cylinder liner is shown in position for reboring, held in jigs made for proper alignment and support, exactly as the cylinder liner is supported in the engine. in the foreground is a second liner, already rebored, ready for the final honing which is not required to improve the accuracy of the bore, but to give the desired finish with less time than would be required in the boring mill.

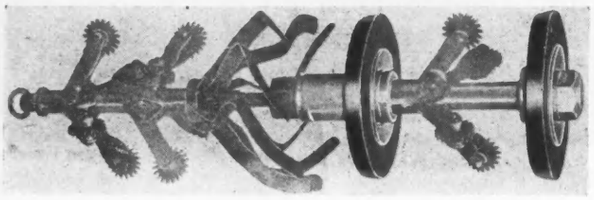
The pistons were easy to machine, as the 24-inch engine lathe available was of adequate capacity. But here again a little planning was required. Piston ring grooves wear in service and must be widened for new rings. Pistons were purchased as oversize and were, therefore, equipped with narrow piston ring grooves. When these oversize pistons had worn in service and were ready to be re-machined to standard size, the piston ring grooves were also re-machined to the manufacturers' standard width. Again, when the standard pistons had worn in service to the point where they required re-machining, they were turned to undersize and the ring grooves were re-machined to a greater width. That made three sizes of piston rings to be stocked. Actually, more than three sizes were required, because extra piston rings were purchased to take care of ring grooves on the firing end which wore several thousandths of an inch after a few years of service. These rings, .003 and .005-inch oversize, were stocked in small quantities. All piston rings were purchased through a central warehouse and orders placed at regular intervals to bring the stock in each size up to the set figure. After the plan was completed, all the work became routine and central warehousing made the total number of rings on the shelf, at any one time, less than had been carried before the program was started.

The average piston and cylinder liner, based on records over the past 10 years, and including accident cases as well as routine maintenance, is operating 75,000 hours before being removed from service for re-machining. Since each is used three times, the total life is 225,000 hours. By that time, the casting is due a pension.

This example of the development of a planned method of machining pistons and cylinder liners is used to illustrate that standardization of repair parts can be used to reduce maintenance. Maintenance crews become more efficient in their work when they have a minimum number of types of machinery to work on and a uniform supply of repair parts. Where it has been necessary, due to abnormal conditions, to build stations with only one engine or pump of a given make, it will usually be found that insufficient attention can be given to these odd units to cure their minor difficulties. In consequence, the little troubles become big ones, and all too frequently, the machinery is condemned because the proper "know how" has not been developed.

For 27 Years...





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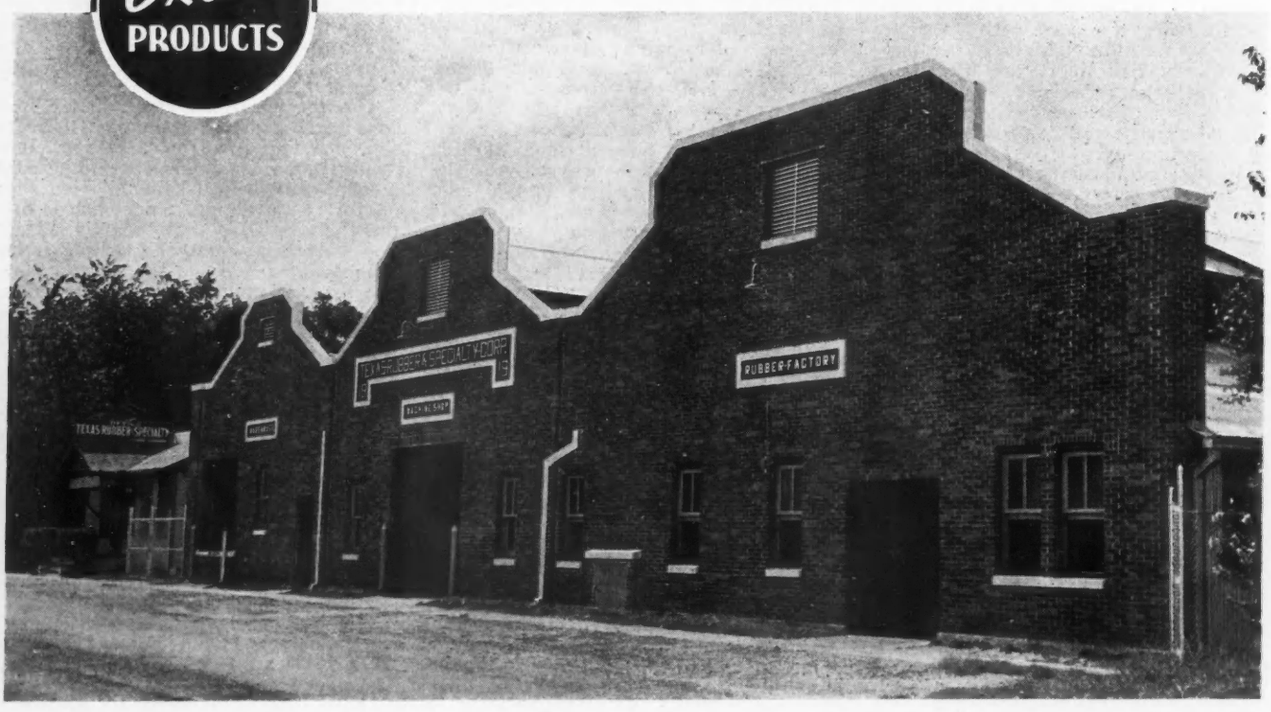


Portable Pumping Units In Peacetime

By HOWARD F. STOVER
Executive Vice President
Gaso Pump & Burner
Manufacturing Company

COMPETENT military authorities have estimated that the war in Europe was shortened by at least a year through the successful use of portable pipe lines and pumping units. Although this type of equipment is not new to the oil industry and was originally designed and put into operation in the late 1920's, the glamor of its operations during wartime focused attention upon it. Many articles have appeared on the design, construction and use of the portable pipe lines used by the army to transport fuel to fighting fronts so that their technical details are familiar to most oil men.

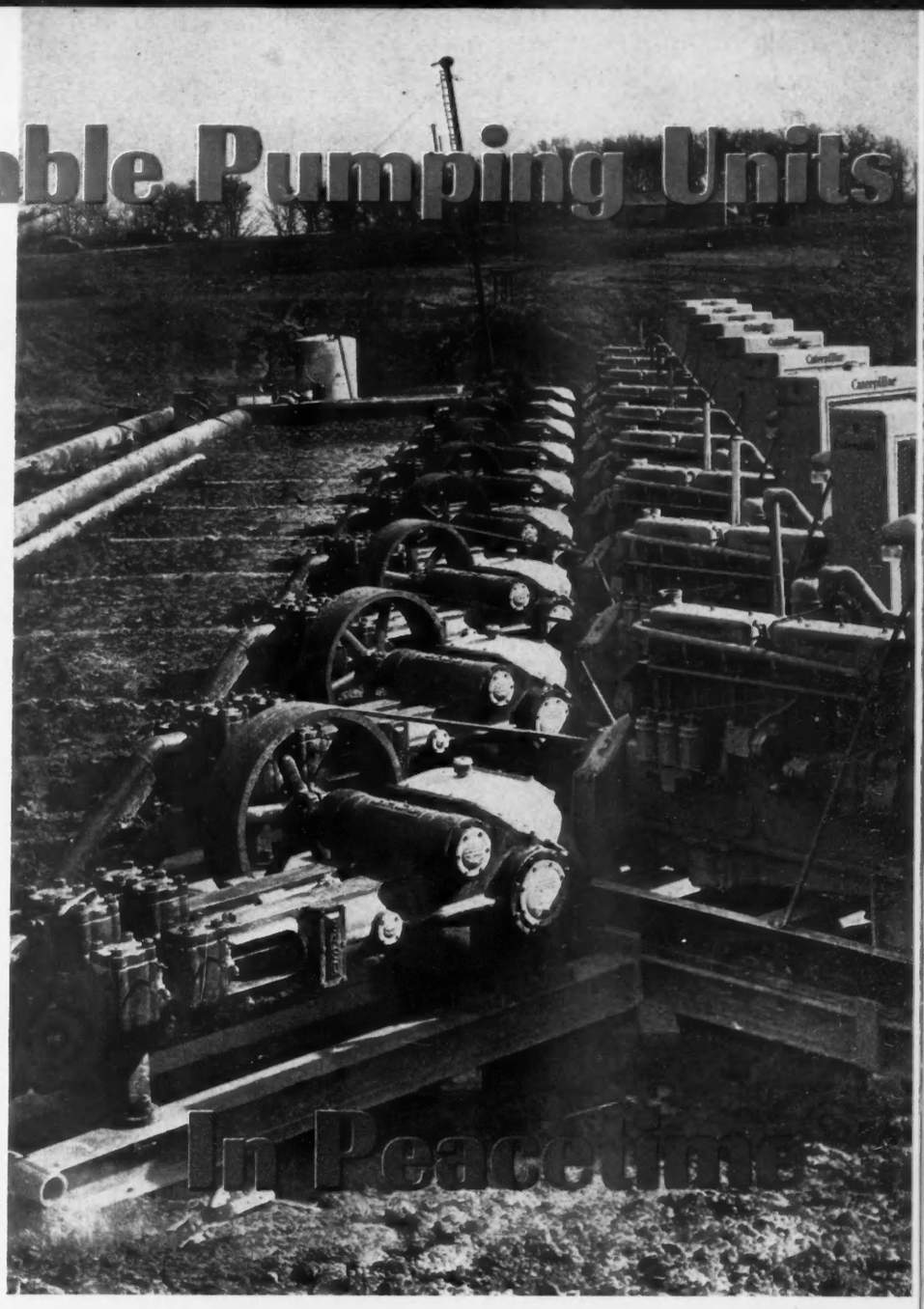
With the end of the war the portable pipe line and pump has been "demobilized" and it has returned to serve the oil industry in peacetime. The experience gained during the conflict emphasizes the importance of the equipment in peacetime and with the expansion of the oil industry into areas outside the continental U. S. where transportation poses one of the major operational problems, the advantages of the portable pipe line and pumping unit are becoming more apparent.

It is well to review some of the salient features of the lines. These include (1) the use of lightweight, flexible pipe; (2) the use of flexible couplings, and (3) the use of compact and portable pumping equipment.

During the war the lines were laid with almost incredible speed, were comparatively safe from enemy air attack, could be quickly repaired in case of damage, and offered a high degree of control, flexibility and salvability.

Only through the use of the portable pipe lines was it possible for the pumping units to furnish sufficient gasoline for the innumerable combat missions flown during the war. Each unit did the work that would have had to be done by 200 army trucks daily, and it is estimated that this equipment pumped over 50 million gallons of aviation gasoline.

The war job of the portable pipe lines has been done. What lessons has it taught for peacetime application? What use will be made of the Army's experience and the vast amount of operational and performance information that has been accumulated? Both manufacturers and pipeliners have studied the records and feel confident that the lessons learned will be applied and that the industry as a whole will benefit both from the standpoint of economy and efficiency.



The initial installation of nine units consisting of 4½ x 10-inch pumps, capacity 200 barrels per hour each, 750 pounds working pressure. They were installed in an open field to move approximately 42,000 barrels of oil daily.

Peacetime Place

There is a definite place in peacetime for the portable pipe line and pumping unit. Before the war the pumping unit was well established in the industry's operational picture and already it is reaching out into new fields where it is peculiarly adapted. Because of its design and peculiar advantages this equipment will contribute appreciably in the development of foreign oil fields by surmounting many obstacles which could not be conveniently and economically overcome by heavier, conventional-type equipment.

The military pipe lines have taught us little about principles but a great deal about their application. Pipeline men knew about flexibility, couplings and portable pumping stations long before the war. It was, in fact, their experience and experiments that made possible the quick development of a military system of lines. But the urgency of wartime needs necessitated a more extensive and daring use of this type of line than could possibly have been attempted in peacetime. The work of the Army Engineers compressed into a few years experience that could not have been gained in decades. As a result, we have access to data and records which provide a new and fairly exact idea of the potentials of this form of line and its application to peacetime problems.

The portable lines and pumps provide the operator with an additional choice of action in his approach to conditions that are constantly arising. They will permit, in many cases, to combine action with caution at a time when governmental control or scrutiny of prices may dictate tighter budgets in the pipe line department. For example, there are instances when the decision to lay or not to lay a permanent line may hang in the balance. In such cases, the portable type line will enable the company to provide transport facilities with the assurance that if and when it is replaced with an underground line its component units can be quickly taken up and used elsewhere.

In other cases a new well or field may call for transportation facilities before its full production possibilities have been determined. If companies are limited to the conventional type of line they may be forced to use guesswork in arriving at the proper size and capacity with the

The original installation housed and six additional units set up in the yard as temporary installations. This new equipment was necessary since the field had developed rapidly with the production increasing to 60,000 barrels per day. Because of availability and flexibility of operation the portable units met the operator's problem quickly and economically.

danger that the guess might prove wrong and very expensive. The alternative of a portable line permits the operator to meet immediate needs quickly and defer final action until all facts are available.

Speed Advantage

The portable lines and pumping units have the advantage of speed. Frequently oil can be moving through the pipe before the concrete base of a stationary pumping unit would have hardened. They have the additional advantage of economical first cost and a high degree of salvability. They require a minimum of labor and equipment. They simplify the right-of-way problem because they entail no clearing of woodland, trench-digging or permanent pump-house structures.

Advantages of the portable pumping unit in peacetime operations may be classified as follows:

1. Lower initial investment.
2. Immediate delivery due to availability.
3. Much quicker installation.
4. Flexibility in the operation of multiple units.

Flexibility is a very important advantage. As an example, assume that a company desires to move 20,000 barrels of oil daily. By installing three 12-inch portable pumping units, each capable of handling 7000 barrels at 1000 pounds working pressure, the operator has the required power to handle the job. However, should one unit break down he would still have the power to handle 14,000 barrels of oil daily and even if two units were out of order he could still move a third of his production. If an additional standby unit were installed the operator could be assured of almost continuous operation since it is unlikely that more than one unit will go out at a time. This could not be the case if only one conventional type pumping unit were in operation since the oil flow would automatically stop if the permanent unit broke down. Only by the heavy expenditure involved in the installation of a duplicate heavy unit, which would be idle most of the time, could the operator assure continuous oil flow through the lines, regardless of breakdown. This applies to a single station installation.

On the other hand, the heavier type pumping unit has advantages over the portable which cannot be overlooked and which include a longer life for the engine or prime mover, and less expense in maintenance of valves and fittings due to slower speeds.

Equipment salvability is a big item and to emphasize this advantage the case of a Mid-Continent operator may be cited. The operator had laid an underground crude oil line but field developments resulting in increased oil production brought the need for additional equipment which was required on short notice. Heavier equipment was unavailable so it was decided to install stations equipped with portable units consisting of 10 and 12-inch stroke horizontal duplex piston pumps and diesel high speed engines. This equipment operated satisfactorily for about four years and at the end of that time the equipment was moved to another location. Salvage in this case was reported at 100 percent.

Records of another Mid-Continent operator show that operating, or actual out-of-pocket costs on labor, fuel, lube oil and maintenance, station supplies, interest on investment and taxes are comparable with expense items for the conventional style, large diesel with reciprocating plunger pumps. The salvability factor naturally was higher since the portables could be moved more economically to any desired location than would be the case when heavier equipment is involved. As early as 1928 a major pipe line company operating in the Mid-Continent area and one of the first users of portable pumping installations, kept a careful check on operating costs and proved to its own satisfaction that it could install and maintain portable equipment at a substantial saving over the conventional, heavy installation.

Portable pumping units have a definite place in the peacetime operations of the oil industry all over the world. Manufacturers and users, naturally, recognize their limitations and it is not inferred that because of spectacular performance during the war the portable is going to replace underground pipe lines and heavy, slow-speed pumping equipment. There is a definite place in the industry for both types of equipment. In fact, one complements the other and careful analysis by pipe line and production men will show which installation should be installed to meet a particular problem.

Foreign Use

Applying the lessons learned in wartime operations, it is logical to assume that the portable pipe line and pumping unit will be very much "at home" during the initial period of exploring in South America and other foreign countries where there are few railroads and practically no highways into interior regions. For many years to come, American prospectors will be penetrating deeper and deeper into the interior of Venezuela, Colombia, Brazil and other countries where there is a good chance of finding petroleum. During these initial exploratory stages the portable units will be used extensively for furnishing water to camps and wildcat wells as well as serving as semi-permanent outlets for new oil, and for other requirements where the installation of heavier and more permanent equipment would be impractical and expensive. Portable units can be easily transported by truck or ox carts and many have already been shipped to foreign countries and are being set up in areas where, until the oil man penetrated, few white men had been seen.

The accompanying photographs graphically describe the place and the function of the portable pumping unit in the peacetime activities of the oil industry.

Since the photographs were taken the field has reached its peak and production is falling off. As pumping demands decrease units are being disconnected and moved to other locations, there to meet comparable problems where developed production must be moved quickly and economically.

Portable pipe lines and pumping units are expected to find other peacetime uses outside the oil industry and manufacturers and engineers are surveying the field. Municipalities here and in foreign countries have been studying their adaptability and economy and it is expected that they will find favor in the construction field. Small communities will probably utilize this type of equipment for pumping potable water and the units are ideal for temporary camps where heavier, permanent installations would be too expensive to install.

INTERNAL PIPE LINE TOOLS *Developments*

By A. M. HILL, Superintendent Line Maintenance
Stanolind Pipe Line Company

SOON after the development of overland pipe line systems for transporting crude oil from the producing areas in the Eastern United States to refineries and river terminals, the operators recognized the need for a device to remove the accumulations of paraffin which adhered to the internal walls of the pipe, also sediment which settled in creek and river crossings and low areas traversed by the lines. These accumulations increased the pressure required to move the oil, and seriously affected the operating efficiency of the small diameter lines which were constructed of 4, 6, and 8-inch pipe. This conception led to the development of a mechanical device known as a go-devil or pipe line scraper. Such tools were run through the lines periodically which removed the accumulations, thus effecting more efficient operations.

The go-devil scraper was propelled through the pipe line by the force of the oil stream acting against two circular leather discs which were of slightly larger diameter than the inside of the pipe. According to authentic information, this type of tool had been in general use throughout the pipe line industry from 1890 until 1922. The operation and cleaning efficiency of this tool was generally satisfactory in lines constructed of thread and coupled pipe, because this type of joint does not offer any restrictions to the passage of scrapers. The central body of the tool was equipped with a spring loaded ball joint; the guide arms, scraper knives, and disc supports were likewise equipped with springs which provided the flexibility required for the tool to pass through short radius bends and joints of pipe which were deformed or flattened during the construction period.

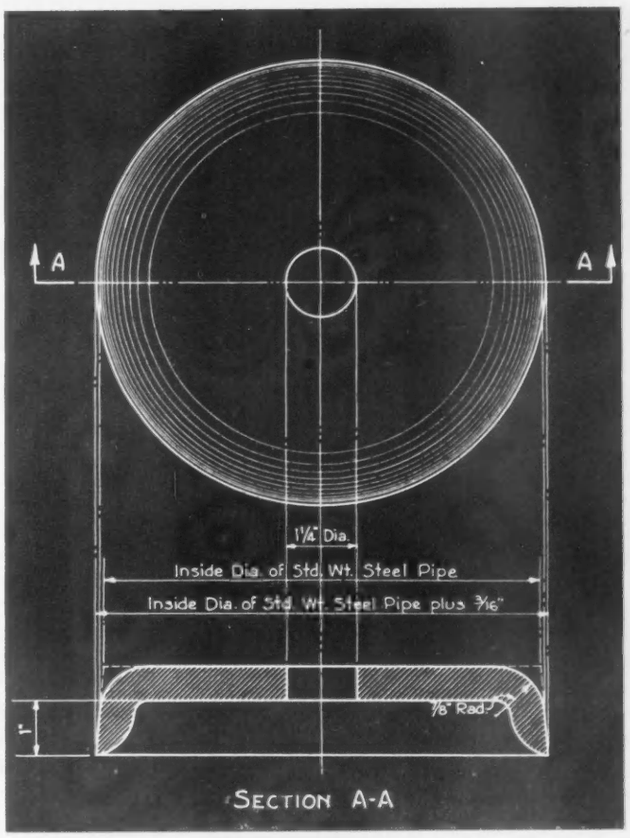


FIGURE 1

Need for New Tool

With the advent of welded pipe lines during the early part of 1922, considerable trouble was experienced in running the go-devil-type scraper because of the metal dross and icicles inside the pipe. In many instances these obstructions blocked the passage of the tool or damaged it to the extent that its efficiency was impaired. The need for a new tool was obvious and the manufacturers subsequently introduced a tool of much heavier design. Several years later the go-devil was equipped with flat rubber discs supported by circular steel plates. These supplanted the leather discs and spring supports. The improvements increased the efficiency of the tool; however, such tools frequently lodged and had to be removed which necessitated draining and cutting the pipe line. This entailed considerable expense in addition to the loss of revenue because of disrupted operations. In 1937 a large pipe line company in cooperation with a leading rubber company developed a cupped synthetic rubber disc which was made available to the industry to replace the flat rubber discs as a means of propelling pipe line scrapers.

Although the basic principles (i.e.—central body and circular discs) of the original tools are found in all modern pipe line cleaning tools, development of the cupped rubber disc (see Figure 1) influenced the design of a new internal cleaning tool known as a pipe line pig, which differs in many respects from the go-devil scraper. Development of this tool has extended the use of internal pipe line tools to natural gas transmission lines, petroleum products lines, water mains, and disposal pipe lines. Also, the progress of constructing new pipe lines has been greatly facilitated in recent years by the development of a special swab which is propelled through the completed sections of lines with compressed air to remove dirt, mill scale, and other obstructions. The tool is equipped with a gauging plate of the required diameter to test welds for metal dross and icicles, and the uniformity of bends which may have been buckled or flattened during the construction period to the extent that the passage of the regular internal cleaning tool might be blocked.

A special tool equipped with cupped rubber discs is used by some pipe line companies as a separating device. It is run through the line between two different types of crude oil, to reduce the contamination or mixture of the heads and tails of the batches.

Various Types

One firm specializing in pipe line equipment has developed pipe line tools for the following operations:

1. A cleaning tool for the removal of paraffin and sediment from crude oil pipe lines: removal of iron oxides and sediment from petroleum products lines; removal of calcium carbonate and other accumulations from disposal lines.
2. A cleaning tool for natural gas transmission lines.

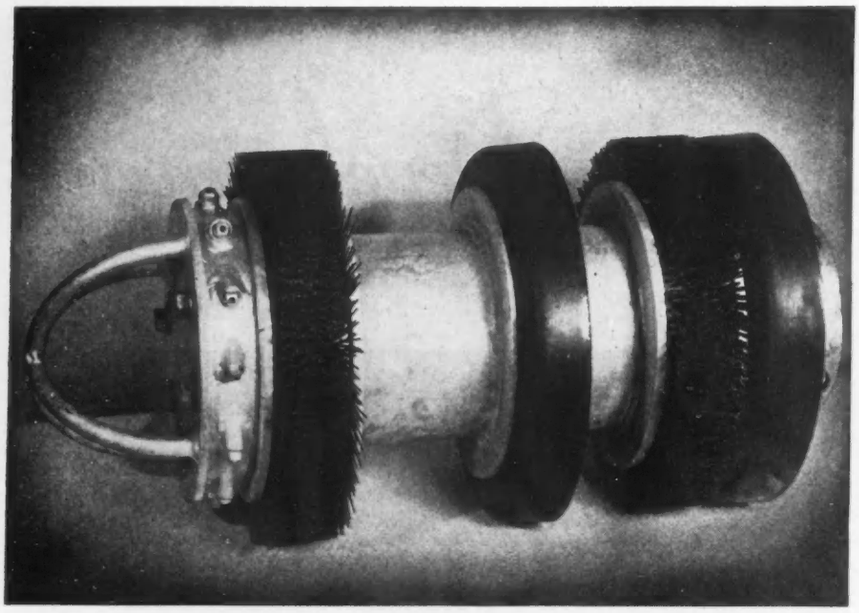


FIGURE 2

3. A cleaning tool for swabbing newly constructed pipe lines.
4. A separating tool for batching operations through pipe lines which handle several different grades of crude oil.

These various types of tools, and their uses, are more fully described in the following paragraphs:

The modern cleaning tool referred to above in Paragraph 1 is shown in Figure 2. It has proved to be efficient for removing paraffin and sediment from crude oil pipe lines as well as iron oxides and sediment from petroleum products lines. It will be noted that this tool is rather simple as compared with the pipe line scraper or go-devil, which is composed of over 100 separate parts consisting of small bronze castings, also machined and forged steel shapes. These small parts were subjected to rapid wear, and because of the inherent weakness of the go-devil it was not advisable to run it a greater distance than 40 miles. Tools of the improved design have travelled a distance of 300 miles before the rubber cups and steel brushes (which make contact with the pipe) were worn excessively, or to the extent that replacement was necessary. This is an important advantage in the design of new pipe lines, as it is possible to increase the distance between scraper junctions. Some of the newly constructed pipe lines which do not exceed 150 miles in length, were not equipped with scraper junctions at the intermediate points. With this design the internal cleaning tool may be inserted in the line at the pumping station and removed at the terminal point.

The modern tool is of sturdy construction and its operation is not affected by minor obstructions in the pipe line. In many instances tools of similar design have dislodged small skids, bars, wrenches, and other objects left in the line by the construction crews which the go-devil type of scraper had passed over when previously run through the same line. It is evident that this modern tool has improved pipe line operation and effected a substantial saving in maintenance costs. Although this tool was designed principally for use in oil pipe lines and petroleum products lines, it has been successfully used for cleaning water lines, and salt water disposal lines.

In recent years the new internal cleaning tool has been developed for natural gas transmission lines referred to above in Paragraph 2. Although the author has not had an opportunity to observe its operation, reports available at this time indicate that the results obtained from this tool have been very satisfactory; it has passed the experimental stage.

Both the oil type and natural gas type tools embody a newly-invented jet principle which utilizes the differential pressure acting on the cupped rubber discs to rotate the tool by permitting a portion of the oil or gas to flow through the tubular body and a series of small jets placed in the nose of the tool. Recent tests of the rotation pipe tool indicate that the wear on the cupped rubber discs and steel brushes is distributed and should therefore improve the efficiency of these parts.

Swabbing Newly Constructed Pipe Lines (Paragraph 3 Above)

Prior to the development of modern practices of laying pipe, a joint at a time over the ditch (referred to as stove-pipe method), the pipe was aligned on skids along the ditch in sections of five or more joints, and roll-welded. These sections were swabbed mechanically preparatory to placing in final alignment over the ditch for welding into a continuous section. The purpose of swabbing was to remove dirt and other obstructions, and to test the welds for metal dross or icicles, also to test for buckled or flattened bends which would block the passage of the internal cleaning tool. A crew of four or five men was needed to carry on the swabbing operation, due to the cumbersome equipment used, which consisted of a heavy swab, 200 to 300 feet of size 1½ or two-inch pipe for swab stem, also a tractor or other motive power to drag the swab through the long sections of pipe. Mechanical swabbing became obsolete with the developing of the stove-pipe method of laying lines. In 1939 new methods were developed for swabbing pipe lines during the construction period. Figure 3 shows a modern tool which is propelled through newly completed sections of the line by compressed air. This method has proved very efficient. It has been adopted by several pipe line companies and is a part of the pipe line construction specifications.

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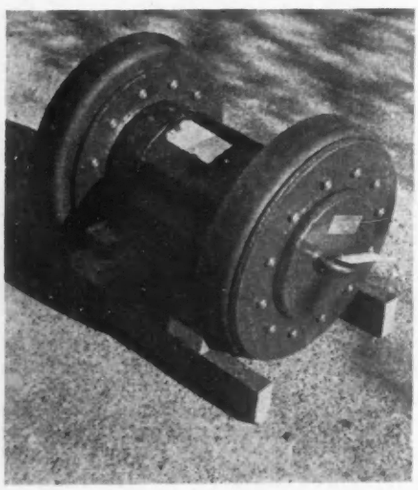


FIGURE 3

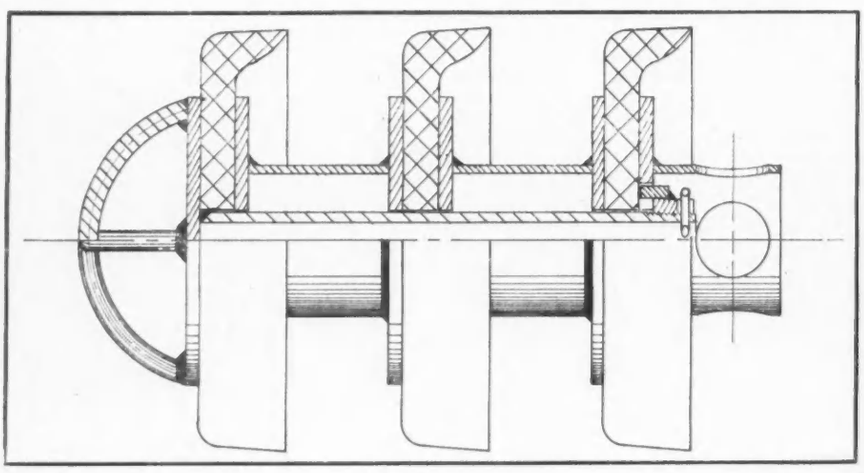


FIGURE 4

Aerial Patrol Pipe Line Practice

An experiment in 1938, aerial pipe line patrol is fast being accepted throughout the industry

By GLEASON ROMANS
Airplane Pipe Line Patrol Company
Tulsa, Oklahoma

PATROL of pipe lines by air was introduced as an experiment in 1938. However, due in part to the scarcity of necessary equipment and trained personnel during the critical war years, the procedure was not given serious consideration by the majority of pipe line companies until a few years ago. During the past 18 months of thorough trial, the method has proven so practical and economical that it is rapidly becoming accepted throughout the industry. Particularly is aerial patrol advantageous in the maintenance of lines crossing mountainous or rough terrain. Sections which would require a linewalker days to cover, can be satisfactorily patrolled in a matter of hours by a pilot and plane.

In fact, its speed and accuracy in the emergency location of leaks in rough terrain first focused the attention of pipe line companies on the feasibility of aerial patrol. One company cites as an example, its first experience, which followed the report of a pressure drop on the line at a station in the mountains. A plane was chartered to cover the section of line. Within two hours the leak had been located and a maintenance gang was on its way to effect necessary repairs, which incidentally were completed in far less time than would have been required to have located this break by walking the line.

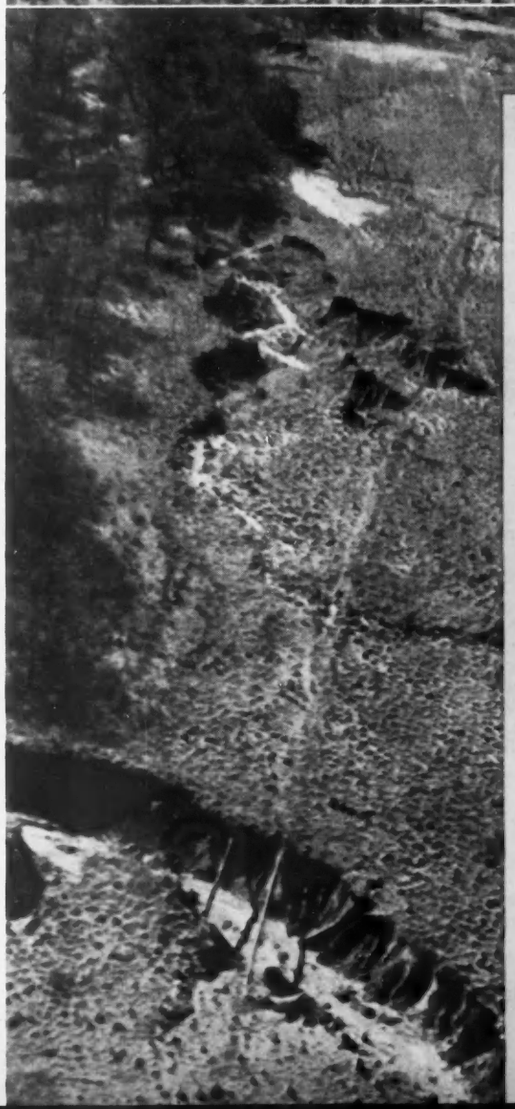
Triple Saving

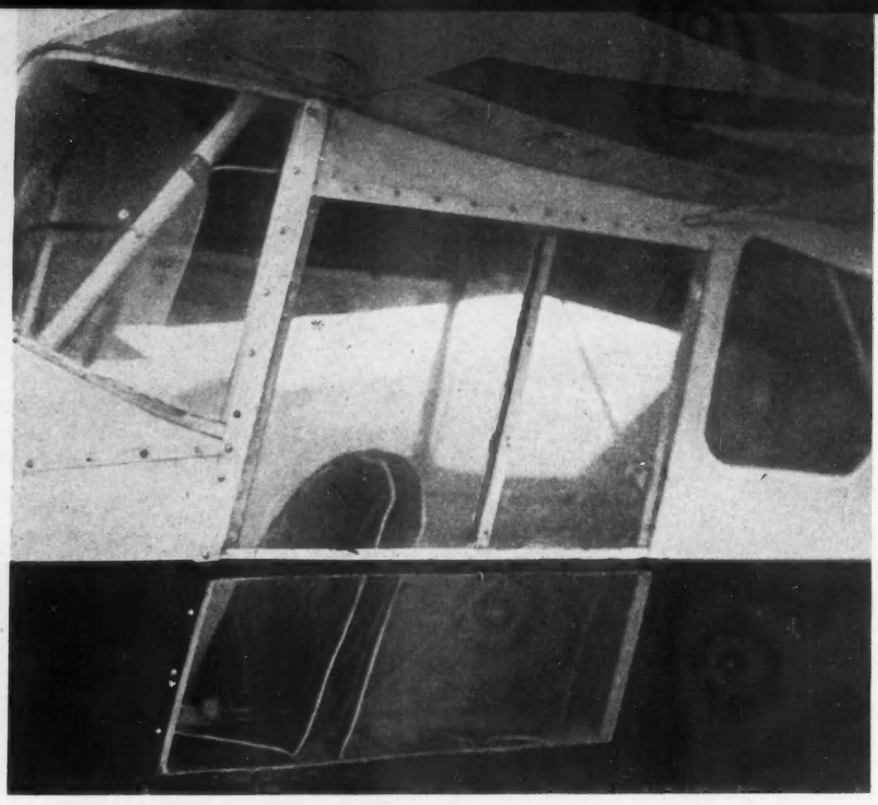
Consequently, there was a saving in time during which the line was out of service and in the amount of oil lost. Naturally, since there was less oil lost and less time for it to spread, there was a reduction in the amount of damage done by lost oil and in the amount of claims which followed.

The practicability of using the airplane in such instances not only attracted the attention of the industry, but also aroused the interest of commercial flyers in the possibilities of regular patrol, and resulted in several firms specializing in this type of service.

While in some instances pipe line companies own the planes and employ the trained personnel to cover their own lines by air, the economies to be effected by the elimination of dead-head mileage and in insurance have encouraged many companies using the method to contract their patrols to commercial aviation firms. The contractor serving a number of companies can in many instances arrange flights to cover the lines of one company on a trip out from his base of operations, and the lines of another company on the return trip, thus eliminating expensive dead-head mileage and cutting in half the cost to the companies. Also,

Top photo, a fresh pipe line leak photographed from the air.
Lower photo, a pipe line exposed by erosion. Such danger points can be quickly protected before damage to the line results. This picture also shows how easy it is to follow the course of the pipe line right-of-way from the air.





Plex-o-glass extension of airplane side window provides the pilot with greater visibility.

the contractor patrolling the lines of a number of companies has full time work for his equipment and personnel, thus realizing a quicker return on his investment and further reducing his expense under the cost of operating private equipment, which may at times be idle.

Customarily, the contractor maintains at his own expense with an insurance agency satisfactory to the companies he serves, workmen's compensation and employers liability insurance. Limits of $25,000 for each fatal injury, public liability insurance with limits of $100,000 and $300,000, property damage insurance with limits of $100,000, and passenger liability insurance with limits of $25,000 are the terms of a typical contract.

Preferred Planes

High-wing, cabin type monoplanes with a cruising range of approximately five or six hours and a cruising speed of approximately 70 miles per hour have been found most practical for this work. Transparent Plex-o-glass windows in critical blind spots on the plane gives the pilot-observer uninterrupted vision of the right-of-way below.

There has been some consideration of the feasibility of using helicopters for patrolling pipe lines, and although it is possible they may have some advantages over the conventional type of small plane now in use, they are not as yet considered practical for this purpose due to the investment, maintenance cost and complicated operation.

It is customary for the pipe line company to furnish the contractor with maps scaled ½ inch to the mile and showing the lines and station locations. These are pasted together and fitted on rollers in the cockpit of the plane, thus the pilot constantly has before him a map of the section of the line he is covering.

Also, fence posts are marked with identifying colors assigned to the company where its lines cross section lines, in order that the pilot may more easily follow the right-of-way. Numbered markers at intervals of three to five miles enable the pilot to give exact locations in reporting leaks. Where communication lines follow the pipe lines, these markers are placed on telegraph or telephone poles at the required intervals. If no line pole is available the mileage markers are placed on short posts erected for the purpose.

A pad of report forms and binoculars for the pilot complete the necessary equipment for aerial pipe line patrol.

Before taking off from the initial terminal, it is customary for the pilot to contact the pipe line dispatcher, advising him of the time the plane will reach the first station on the section of line to be covered. Each station notifies the succeeding station and the dispatcher as the patrol passes.

Reporting Leaks

Leaks, or other emergency conditions requiring immediate attention, discovered by the pipe line aerial patrol are reported to the next station on the line through the simple expedient of dropping a note tied to a small sand bag. Station personnel, advised in advance that the patrol is on its way, is on the lookout for such messages. A set of signals by means of flags enable station personnel to communicate with the pilot as he flys over, if, for example, pressure has suddenly dropped or, for some other reason, the company desires the patrol to re-cover a section of line.

Feasibility of the use of two-way short wave radio as a means of ground-air communication is being considered but practical experiments along these lines have been delayed due to scarcity of equipment, also the need for an evaluation of aerial pipe line patrol based on a longer period of use before the expense of such installation is incurred.

One advantage of using the present small type of plane for patrol work is its adaptability for landing in any small field in the event there is need for personal contact between pilot and station crew. Some companies have found it practical to build small inexpensive landing strips adjacent to their stations for use of aerial patrol pilots.

Irregularities not requiring immediate attention are reported by the pilot to the pipe line company on a report form at the completion of his flight. A double-check system whereby the company reports back to the contractor on the disposition of the irregularities and the accuracy of his pilot's observations have proved of immeasurable benefit in developing aerial patrol to its present degree of efficiency.

Unless one has had the actual experience it is difficult to realize how distinctly the right-of-way is visible from the air. Although lines may have been buried for many years and the ground conditions undisturbed, there still remains a certain discoloration visible from the air, although not discernable from the ground, which makes it possible for a pilot to follow a line from terminal to terminal, without other visible guides. Leaks and other irregularities, particularly where oil has escaped, stand out like the proverbial "sore thumb." A difference in discoloration of the ground positively identifies a new leak from an old one which has been repaired.

The aerial patrol flies at altitudes

Evidences of an old leak, long since repaired. Notice how discoloration changes with age, making it possible to distinguish between a fresh and old leak.

ranging from 200 to 400 feet, depending upon weather conditions, and the pilot's ability to observe ground conditions in detail at these low altitudes is amazing. Those dubious as to whether the aerial patrol can as thoroughly cover a section of line as ground patrol, are easily convinced in one trip over a section line. As an example, after effecting repairs on a line recently, one of the workmen inadvertently upset a small pail of "pipe dope," leaving a small discolored spot on the right-of-way. On the next trip over, the aerial patrol spotted and reported this irregularity, proof positive that a leak can be discovered at its very inception when surface indications are negligible. On numerous occasions, leaks have been reported by aerial patrol, and ground crews upon going to the location to make repairs, have been unable to find any surface indications. However, when the line was disinterred the leak was found at the point reported by the aerial patrol. Even gas lines are successfully patrolled by air, leaks causing a discoloration of surrounding vegetation, easily spotted from above although not always visible to ground patrol.

Preventive Maintenance

Although first used for the emergency location of leaks and invaluable for this purpose, the aerial patrol has really found its forte in what may be termed preventive maintenance. From his vantage point in the air the trained observer locates and reports many irregularities along the right-of-way in time for corrective measures to be taken long before trouble on the line ensues—irregularities which might go unnoticed indefinitely by ground patrol. Following is a partial list of items for which pilot-observers regularly watch and report when covering the line:

1. Oil stains and evidences of oil leaks.
2. Washouts.
3. Excavations close to pipe lines.
4. Deposits of debris along the right-of-way.
5. Building of terraces, water points or slush pits along the right-of-way where the line may be exposed.
6. Clearing of timber land in preparation for cultivation.
7. Construction of buildings or well derricks close to the line.
8. Ditching for the construction of new pipe lines.
9. Grading for construction of new roads.
10. Improvement of and grading of existing roads.
11. Construction of drainage and irrigation.
12. Conditions of river beds and streams.
13. Trees and debris collected on lines crossing creeks and rivers.
14. Exposure of pipe lines crossing creeks and rivers.
15. Oil on surface of waters adjacent to pipe line.
16. Waste oil or salt ponds or drainage on the line.
17. Fires of any nature adjacent to the line.
18. Livestock down on right-of-way, possibly dead or mired.

From the above it should be apparent that "flying the line" needs more than just a good pilot. Through the efforts of contractors and the companies they serve, aerial observation of pipe lines is being developed to a high degree and requires experienced and trained personnel. It requires a good pilot whose faculties have been cultivated to the "Nth" degree, one who misses nothing as he flies down the right-of-way and who is capable of interpreting what he observes from above. It requires skill and judgment. Considering the added flying skill required for "hedge-hopping" or flying at extremely low altitudes, and the constant concentration and observation necessary, aerial patrol of pipe lines is hard, gruelling work and no job for the fledgling.

Interior view of pipe line patrol plane. Flight map of pipe line course is on roller in front of pilot, and note-pad is strapped to pilot's knee.

Some companies have found it profitable to permit maintenance supervisors to occasionally cover the section of the system for which they are responsible. This affords the operating man an opportunity to "take in" his entire district, at a glance, and determine immediate and future maintenance requirements. One such supervisor reports he finds it possible to plan his maintenance work for weeks ahead by occasionally flying over his district.

Although commercial contractors at present engaged in the business are convinced that the service they offer is comparable in every way to the benefits to be derived from ground patrol and in many respects superior, in all fairness it should be pointed out that whether or not the linewalker can be entirely replaced by aerial patrol is still controversial within the industry. Some companies employing aerial patrol have done away with ground patrol altogether on the sections of trunk line covered by air and have diverted their linewalkers to covering gathering systems not touched by air. Other companies supplement regular and frequent aerial patrol with occasional ground patrol of the line.

Accurate comparable figures of the cost of aerial and ground patrol of pipe lines are not available for publication with this article; however, costs are not controversial. It has been well established by several companies who are employing the method that aerial patrol is available at approximately one-fifth the cost of covering the line by ground patrol, or that more frequent patrols by air are possible at a cost considerably less than that incurred by less frequent ground patrol.

Brief past experience also establishes that commercial flying firms specializing in this type of work are offering an adequate and constantly improving regular patrol service, with standby planes available for the emergency location of leaks; that numerous pipe line companies who have contracted for the service on an experimental basis, are abandoning ground patrol of trunk lines in its favor.

Aerial patrol of pipe lines is out of the experimental and well into the practical stage. As additional flying and communications equipment is available and additional personnel is trained, this service promises to become an even more valuable ally to the pipe line transporter of petroleum products.

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DIESEL ENGINES

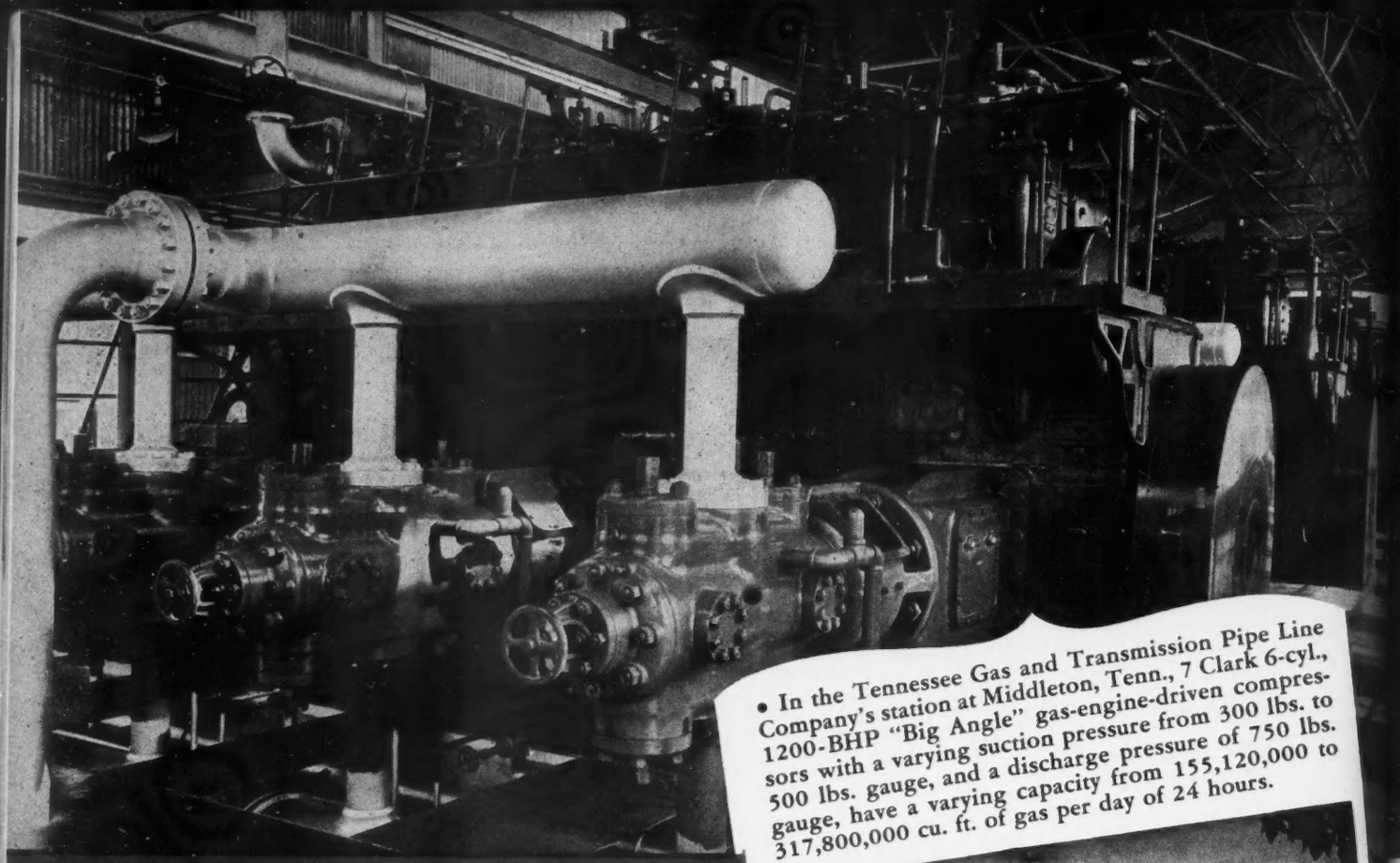
TRENDS AND APPLICATIONS

Early pipe line station. These engines were set in 1908 and are still in operation.

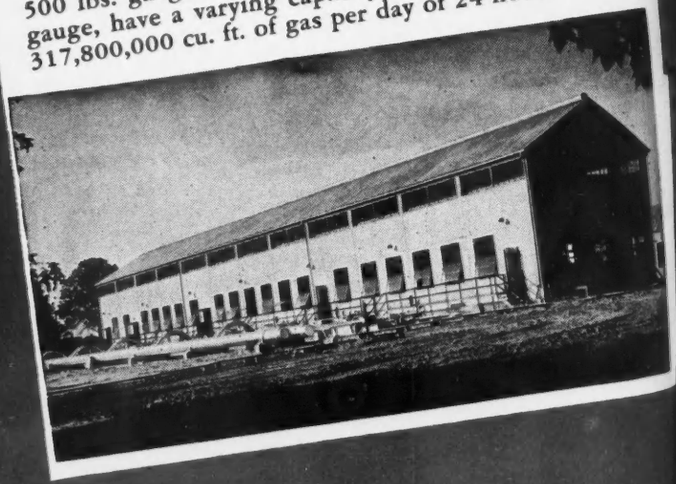
Some idea of the difficulties involved in transporting heavy equipment in 1907 can be gained from the picture below. The 37-ton casting was hauled to location by an 11-ton wagon drawn by 22 teams. The wagon was equipped with 14-inch face wheels with a four-inch square skid ring shrunk on.

THE average person would define a diesel engine as an oil engine that burns its fuel due to the ignition by the heat of compression.

That is essentially true if the term oil is defined. It is unfortunate, perhaps, that gasoline, butane, kerosine, fuel oil and the heaviest bunker oils are all derivatives of petroleum, and in this light all engines burning such fuels could be called oil engines. Until the advent of World War II, the generally accepted definition of a diesel engine was an internal combustion engine that received its injection of fuel at or near the end of the compression stroke by means of



• In the Tennessee Gas and Transmission Pipe Line Company's station at Middleton, Tenn., 7 Clark 6-cyl., 1200-BHP "Big Angle" gas-engine-driven compressors with a varying suction pressure from 300 lbs. to 500 lbs. gauge, and a discharge pressure of 750 lbs. gauge, have a varying capacity from 155,120,000 to 317,800,000 cu. ft. of gas per day of 24 hours.



• In the same company's station at Winchester, Ky., 6 Clark 6-cyl., 1200-BHP "Big Angle" gas-engine-driven compressors with a varying suction pressure from 300 lbs. to 500 lbs. gauge, and a discharge pressure of 750 lbs. gauge, have a varying capacity from 132,960,000 to 272,400,000 cu. ft. per day of 24 hours.

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Rating 200 brake horsepower per cylinder, the Clark "Big Angle" unit is the most powerful right-angle gas-engine-driven compressor ever built. It fulfills the industry's demand for greater power in less space and at lower over-all cost.

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For high pressure pipe line pumping and large scale pressure maintenance, the Clark "Big Angle"—BA 17—offers unique advantages. This unit is built in three sizes: 5-cyl., 1000-BHP; 6-cyl., 1200-BHP; 8-cyl., 1600-BHP.

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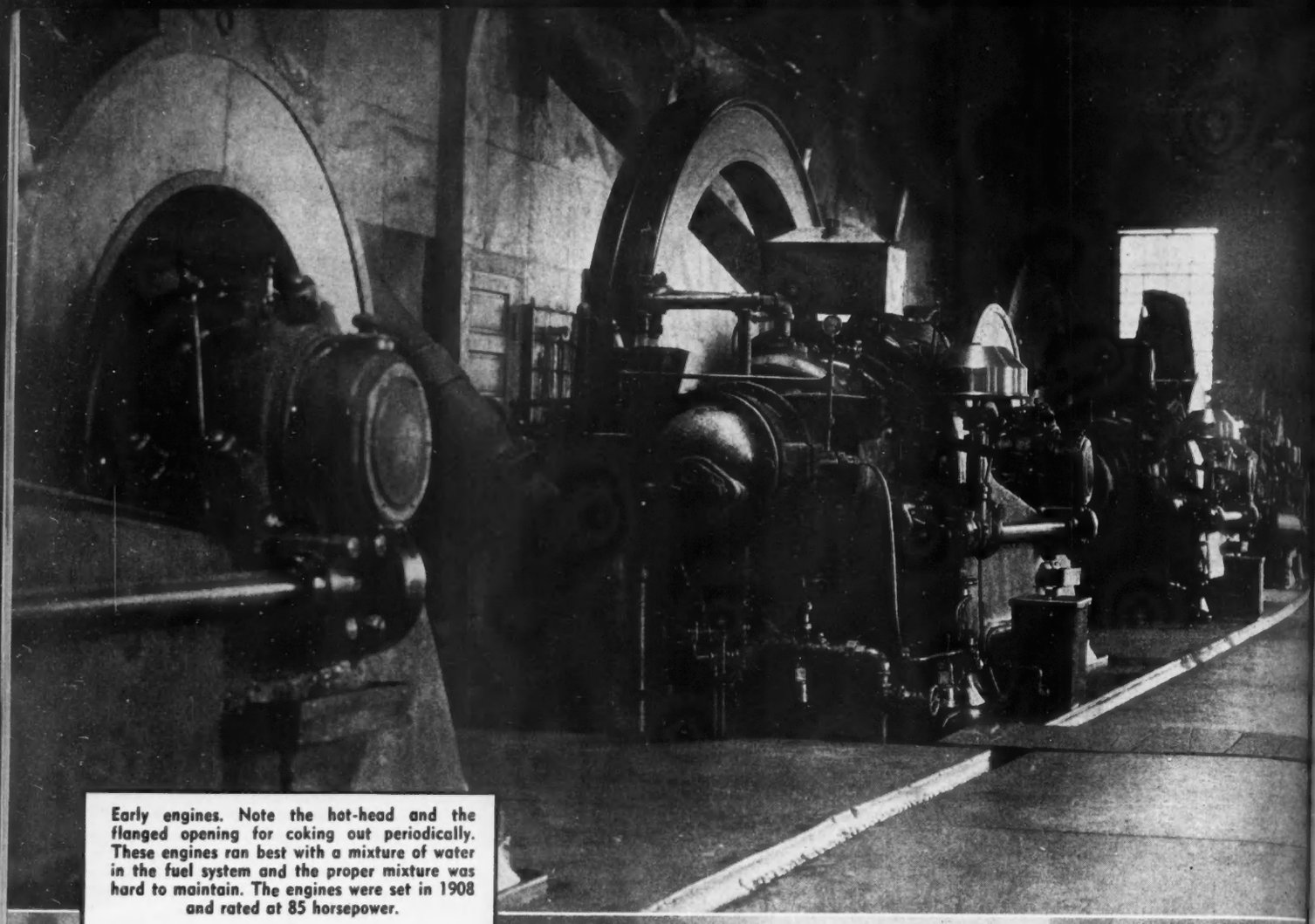
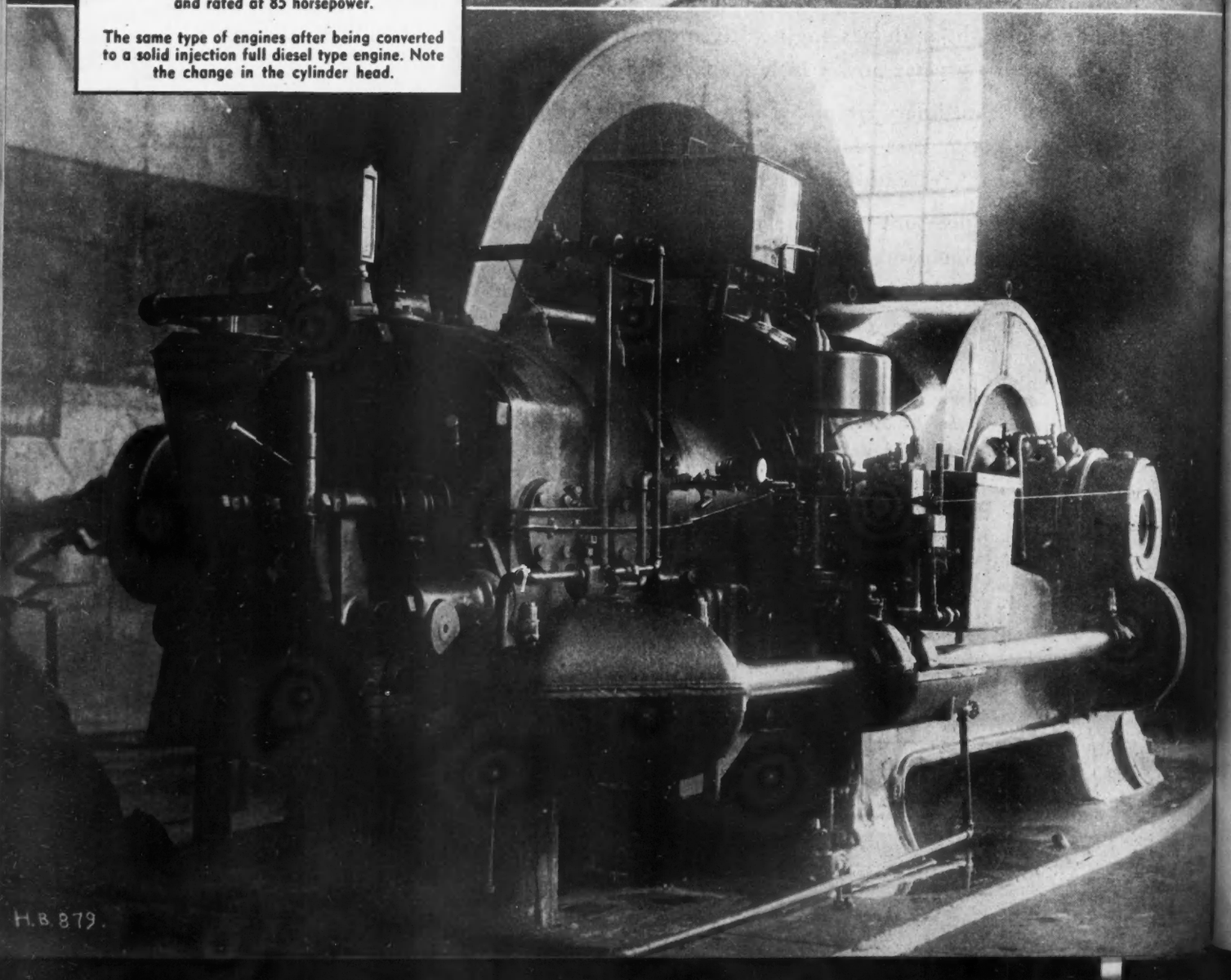


Early engines. Note the hot-head and the flanged opening for coking out periodically. These engines ran best with a mixture of water in the fuel system and the proper mixture was hard to maintain. The engines were set in 1908 and rated at 85 horsepower.

The same type of engines after being converted to a solid injection full diesel type engine. Note the change in the cylinder head.



H.B 879.

either compressed air or mechanical injection. Even prior to World War II some progress had been made in injecting fuel such as gasoline by mechanical means rather than the usual means of carburetion. Perhaps the best illustration of a borderline engine is that used in the Stuka dive bomber by the Germans. The power plant of this airplane burned a low grade of gasoline and yet utilized mechanical injection for introducing fuel into the cylinders. Regardless of the technical definition, the thing that intrigues the average layman probably is the ability of the diesel engine to ignite its fuel from the heat of compression, and thus operate without the known ignition and carburetion troubles that the average man runs into in the normal operation of his automobile.

In 1892, when Dr. Rudolph Diesel began his experiments on what is now known as the diesel cycle, he was not seeking a means of burning oil in an internal combustion engine. Oil engines, such as they were, existed at that time, even though they were more of a laboratory curiosity rather than a power producing mechanism. Dr. Diesel was attempting to find a more economical means of burning powdered coal and a means of doing this in an internal combustion engine. He was not prepared to deal with the tremendous pressures developed in the new cycle with the result that his first experiment saw his engine depart for various and sundry places simultaneously. Proper design corrected the structural weaknesses of his engine, but the thing that defeated Dr. Diesel in his original purpose of burning coal in an internal combustion engine was the difficulty of disposing of the ashes resulting from the combustion of the coal. Staying with his idea despite ridicule and by substituting fuel oil for coal as fuel, Dr. Diesel pioneered what is now known as the diesel cycle and the diesel engine.

A Pioneer's Problems

The new fuel did not at once dispose of all the problems connected with the new "oil engine." Combustion at its best was incomplete and the engines had to be "coked out" periodically. The first engines were not reliable mechanically. Operators of other types of prime movers were not particularly friendly to the new engine. Even as late as 1923 a well-known American author ventured the observation that inasmuch as the known petroleum reserves of the world had been discovered and the total production would soon be declining, the future of the diesel engine was something to be looked upon with a degree of doubt. In spite of all these obstacles, the diesel has attained an enviable position as a source of prime power in marine, municipal, pipe line, mining and smelting industries, among others.

Once-despised diesel attains an enviable position as a prime source of power in numerous industries

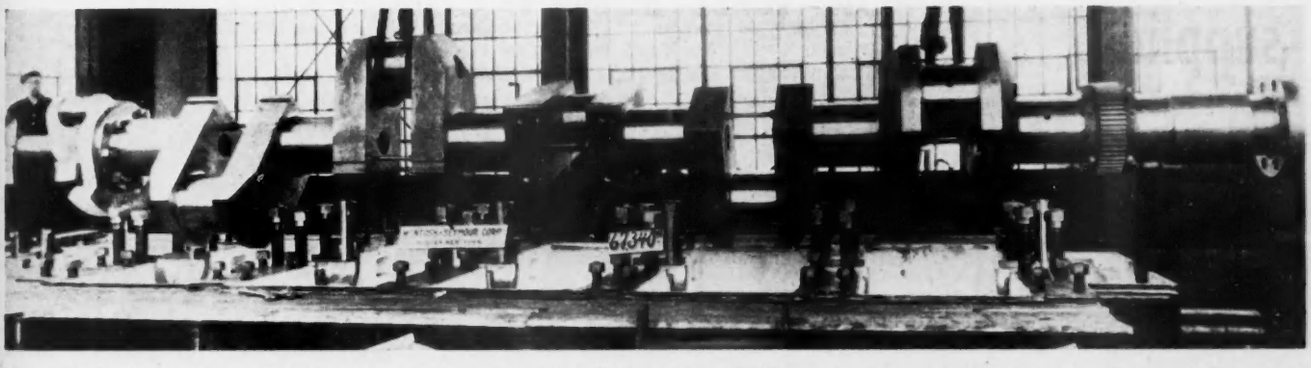
World War II gave diesel engines wide applications in the marine service. The first marine diesel engine was originally installed in a small coastwise ship in 1896, being a 25 horsepower single cylinder engine job that was not too reliable both as to continuity of service and output while in operation. Larger engines were later installed in other coastwise ships and soon the diesel engine found its way into ocean-going service. As could be expected, the first installations were not very reliable mechanically, and this did nothing to assist the engine in overcoming the opposition of the steam-minded operators. Curiously enough, one of the greatest objections to the early diesel engines in ships was the vibration set up by the boom-boom-boom of the slow speed engine exhaust. With this and other objections overcome, diesel engines were installed in such ships recently in the news as the Gripsholm in the liner service, and the former Graf Spee in the fighting ship class. In designing the Graf Spee, its designers are reported to have deliberately sacrificed everything possible in designing the ship in order to allow the maximum weight to go into armor and guns for a ship of its size. In doing this they installed a power plant of such size as to be under full load in the normal cruising speed. Under battle conditions then, the diesel engines would be deliberately overextended and operated at speeds and pressures that would be destructive if continued for a very long period of time. In other words, the power plant of the Graf Spee was considered expendable in time of battle just the same as ammunition. It is a matter of conjecture as to how this idea actually worked out in the battle that resulted in the Graf Spee seeking shelter in Montevideo.

By J. DELBERT JONES
Master Mechanic, Gulf Refining Company, Tulsa Pipe Line Division

The ever-pressing demands of ship operators for more cargo space and less space given to ship operation has resulted in much improvement of the diesel engine. The development of the two-cycle engine all but doubled the horsepower output of an engine without materially increasing either its size or operating difficulties. The further development of the double acting two-cycle engine gave the ship owners capacities unheard of a few years ago, and yet a very reliable power plant. The advent of precision step-down gears and high speeds in the engines have further reduced the space allocated to the prime mover, not to mention supercharging.

Diesels in Submarines

The submarine branch of the Naval service offers one of the most interesting chapters in the development of the diesel engine. The first submarines used were oar-powered, the motive power being furnished by oars manned by 12 sturdy men. Steam was next used as motive power. It is easy to imagine the difficulties experienced when attempting to use this type of prime mover under water. Even so, at the outbreak of World War I, most of the British submarines in service were steam-powered and used primarily for harbor defense. Diesel engines really brought the submarines into their own, but this has not been without certain difficulties. Due to the extremely cramped quarters, these engines have characteristics not usually found in the conventional engine. Pistons must be pulled in sections and removed from the engine through the crankcase door; frames and crankshafts are built in sections in order to expedite and facilitate repairs. Frequently hours will be spent in removing a part inaccessibly located on the engine that



The rough forging for this crankshaft weighed 350 tons. The finished job weighed 67,340 pounds and was the largest single piece crankshaft built in the United States in 1923. The journals and pins were 27 inches in diameter. The crankshaft was for a 4000-horsepower diesel engine, weighing 1,145,000 pounds.

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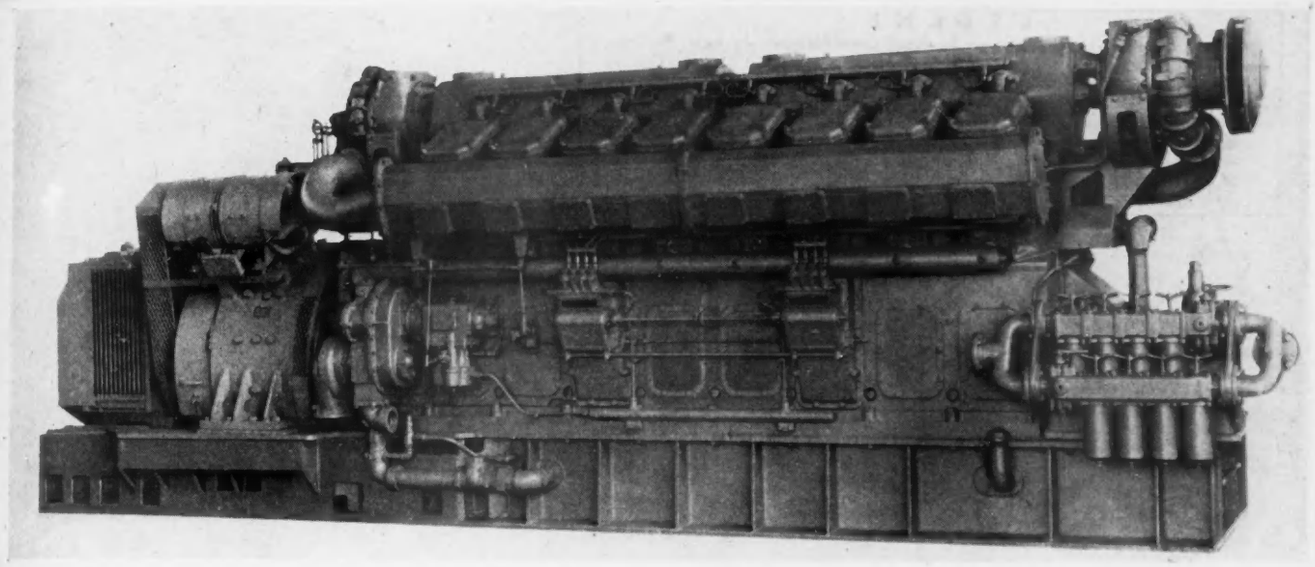


A modern high speed supercharged Diesel engine. Weight of engine alone is 28,000 pounds. The unit as illustrated weighs 55,600 pounds and generates 1600 horsepower.

would require but a few minutes had the engine been located in a power plant building where space was not so precious. This branch of service was responsible for the development of an opposed-piston diesel of medium size that gave a very good account of itself during World War II.

Just as the marine requirements led to the development of special types and applications, the field of municipal power plants led to the development of engines capable of long periods of operation and general reliability. The use of medium size four-cycle engines and the two-cycle engines for larger installations are almost universally used. The largest diesel engines built are used in power plants requiring large quantities of electricity, and the application of diesel engines to this field is ever increasing. In 1926, the largest diesel engine in a power plant in England was a 1750-horsepower engine. The largest known single engine installation is now in Denmark—an eight cylinder, doube acting two-cycle engine of 22,500 horsepower continuous rating. How this engine fared during the war is not known to the author.

In recent installations, high-speed diesel engines have found favor in this and other fields of application. The technique of mass production, improvement of metals, use of welding, better fuels and lubricating oils has resulted in prime movers that are capable of turning in enviable records of performance, and at the same time offering to industry a power plant that can be easily maintained. In the earlier models of diesel engines, most of the parts were made on an individual basis with little thought of interchangeability. Bearings, etc., were hand fitted and costly both in time and materials. With the improvement in materials and design, speeds and pressure went up and the power output per pound of total weight increased. Compare the cost of installing an 85-horsepower engine of 1908 requiring 57 cubic yards of foundation to that of a 1940 model non-supercharged engine of 425 horsepower requiring only 41 cubic yards. A period of a few weeks' operation without repairs by the 1908 engine was considered a record. It is not difficult to find modern engines that have operated for a period of years without a bearing replacement and with no repairs other than an occasional valve grinding job and replacement of rings. When major repairs are required, the down time is very low.

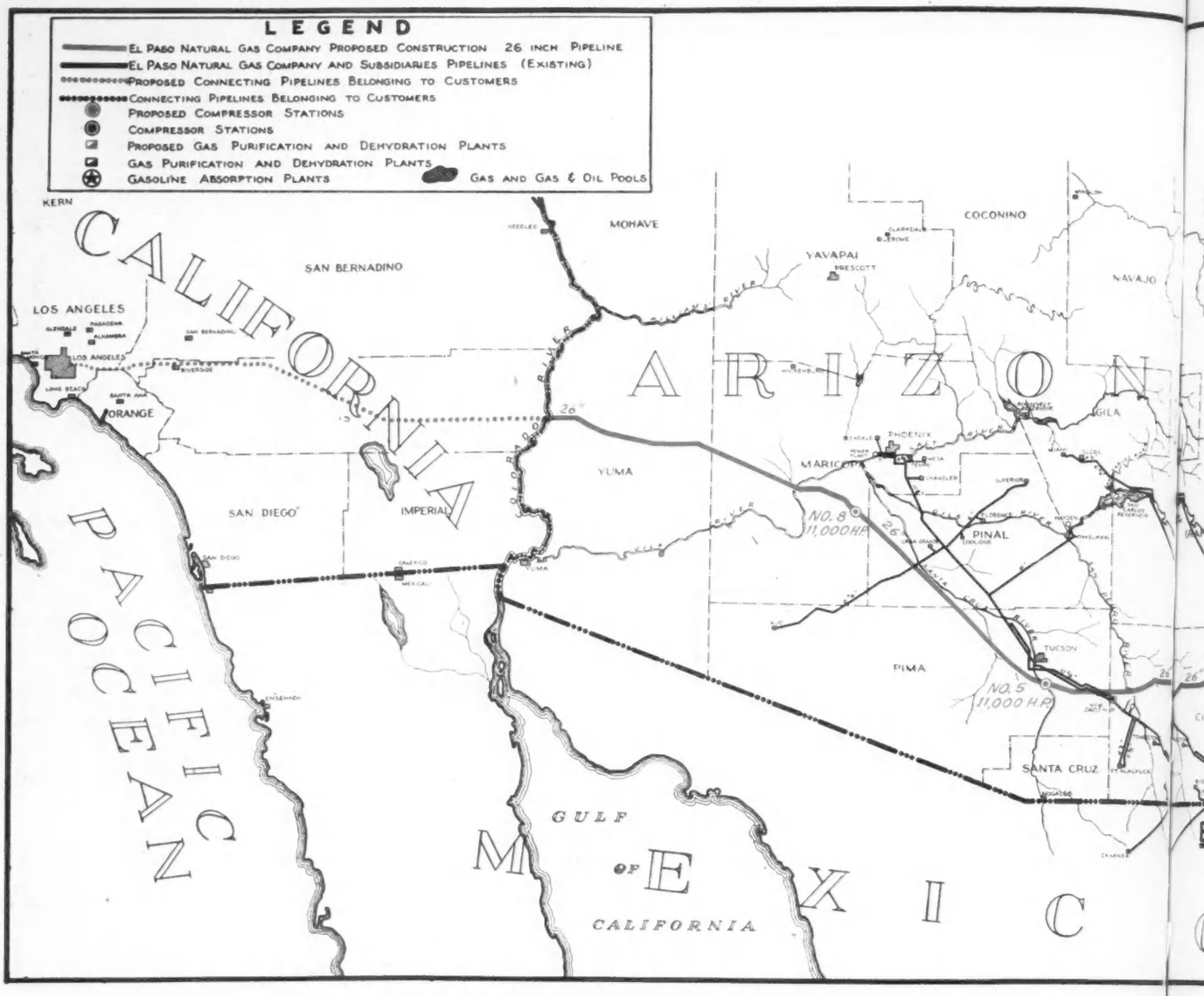
Example of Progress

A graphic example of the progress in design, materials, manufacturing methods can be best illustrated by comparing the crankshaft of a 4000-horsepower engine built in 1923 to the weight of a complete engine being built today. The 1923 crankshaft alone weighs 67,340 pounds. The engine in which it was used weighed 1,145,000 pounds. Compare that weight to the weight of a locomotive type, high speed, supercharged diesel generating, 1600 horsepower and weighing only 28,000 pounds. The weight of the crankshaft alone of the 4000-horsepower engine built in 1923 would produce 3840 horsepower today.

Frequently one industry will favor one type of engine. An example of this is the pipe-line industry that generally favors slow speed, four-cycle diesel engine. This type of engine readily adapted itself to the speeds of the plunger pumps generally used. Two-cycle engines were rarely used except for auxiliary equipment. However, with the advent of trouble-free step-up gears and large centrifugal pumps, other types of engines have found their way into this particular field. Witness the recent order placed for 32 800 horsepower, 600 revolutions per minute, high speed diesel engines for pipe-line service. This is said to be the largest order ever placed for pipe line prime movers. Another purchase of twelve 800 horsepower 375 revolutions per minute engines for pipe line service indicates that engines of the medium and higher speeds have proved themselves reliable enough to compete with earlier types in a very difficult field of operation.

A few years ago the city of Winterset, Iowa, asked for bids for a 500 horsepower diesel engine. The firm that got the contract did so by taking one of their 400 horsepower diesel engines and supercharging it by a belt-driven compressor. This probably was the first supercharged engine ever installed in the United States. The present use of the turbo supercharger makes it possible to concentrate enormous power in a very small space. No other industry has made better use of this development than the railroads. The first contract for a diesel engine locomotive was let in November, 1925, and the first locomotive delivered about 18 months later. The locomotive was powered with a 1345 horsepower 12-cylinder "V" type, non-supercharged engine. The resultant 4-8-4 locomotive had the general appearance of a box car with windows added and headlights fore and aft. From this modest beginning came the modern 4000 horsepower streamlined locomotives that we read so much about today. Incidentally, the first diesel engine locomotive was put into operation on the Putman, N. Y., division of the New York Central Lines. Imagine the difficulties that had to be overcome in getting the first diesel in operation. There was no way to train one special crew for use with this locomotive because of the ruling of the Railroad Brotherhoods that the next crew up took out the next train, to say nothing about the known dislike of steam engineers for anything but steam. A way was found to work out all these things, and the railroad service has given diesel engines a very considerable boost in application.

The types of diesel engines now offered to the public are so broad and varied that they are found in almost every conceivable application, from the smallest 4-horsepower engine to power plants containing as many as eighteen 3600-horsepower engines. The recent application of the dual-fuel principal to diesel engines again brings up the question of what is a diesel engine. To predict where these applications will stop and developments cease is to think ahead ahead today and be left behind tomorrow.



By PAUL KAYSER
President, El Paso Natural Gas Company

Texas-California Gas Line

THE outstanding feature of the recently announced big-inch gas carrier from West Texas to Southern California (THE OIL WEEKLY, June 10, 1946, page 24) is that it provides a market for a vast amount of residue gas that has been going to waste and that it assures California consumers a long-term adequate fuel supply.

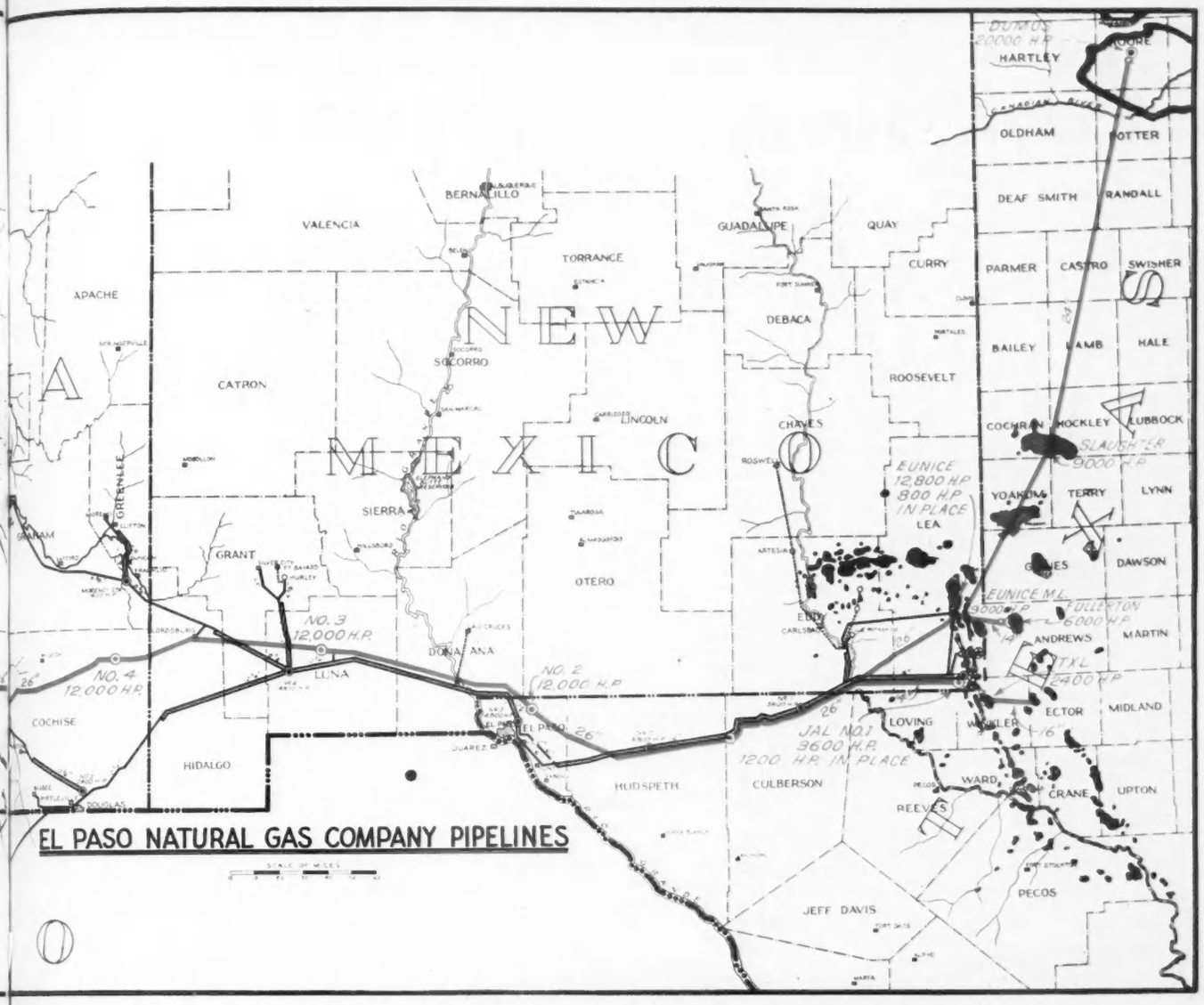
The pipe line will have an initial capacity to deliver 125 million cubic feet per day the first year, 175 million cubic feet per day thereafter until September 1, 1949, at which time it is contemplated the deliveries will be increased to the ultimate capacity of 305 million cubic feet daily. Approximately 75 percent of the latter amount will consist of residue gas now being wasted.

The area served by the two interested California companies has a population in excess of 4 million, and there are approximately 1¼ million meters connected to their systems. The supply of gas in California available to these companies is declining steadily, while the population of the area is increasing constantly. In the language of the street, this makes the line a "natural." It does not displace any other fuel, but on the contrary utilizes a fuel otherwise wasted. in respect to the conservation policy involved, the Federal Power Commission, in its opinion approving the construction of the project, used the following language:

"The Permain Basin in West Texas and New Mexico is spotted with many oil fields, and the major portion of the gas is produced in conjunction with oil production. Large volumes (383,000 mcf daily) of casinghead gas in the field and residue gas from gasoline plants are being wasted in the Permian Basin. An important consideration supporting the granting of this certificate is the strong showing by El Paso that it will probably utilize presently wasted Permian Basin oil well gas for approximately 75 percent of the maximum requirements of 305,000 mcf a day and take the remainder from the dry gas Panhandle and Hugoton fields. This utilization of wasted natural gas for beneficial public use fosters a sound policy of conservation."

History of the Project

Over the past two years the El Paso Company carried on negotiations with the Southern California Gas Company and the Southern Counties Gas Company, the two major companies dis-



Route of the Texas-California natural gas pipe line is shown in red. El Paso Natural Gas Company will construct that portion shown as a solid line, while Southern California Gas Company and Southern Counties Gas Company will jointly build that part shown as a dotted line, which will be 214 miles of 30-inch pipe. The El Paso Company will build 737 miles of 26-inch line from near Eunice, in Lea County, New Mexico, to a point on the Arizona-California boundary near Blythe, Calif.; 251 miles of 24-inch pipe line from near Dumas, in the Texas Panhandle, to Eunice; and several lateral gathering systems in West Texas. To operate at the ultimate capacity of 305 million cubic feet daily will require 131,800 horsepower in field and six main line compressor stations on the El Paso company's portion of the line alone.

To Prevent Much Waste

tributing gas in Southern California with a view to the possibility of constructing a pipe line to transport natural gas to California. These negotiations came to a head in July, 1945, in a conference with the executives of the companies involved. Following this conference, the El Paso company filed with the Federal Power Commission on August 10, 1945, an application for authority to construct a 26-inch pipe line running from the gas fields adjacent to the terminus of the company's existing system in Lea County, New Mexico, to a point on the Arizona-California boundary, at the Colorado River, near Blythe, Cal.

The initial proposal involved the marketing of 125 million cubic feet per day of residue gas produced in connection with oil in the Permian Basin fields in southeastern New Mexico and West Texas, which gas is otherwise being wasted to the air. However, in order to permit entering into a long-term contract with the California companies and to satisfy the requirements for financing the new project, it was necessary to broaden the base of supply by attaching reserves of so-called "dry gas" not associated with the production of oil.

To this end, the El Paso company contracted with Phillips Petroleum Company for deliveries of 75 million cubic feet of residue gas per day form four gasoline absorption plants located in oil fields near the eastern terminus of the new 26-inch line and for an initial supply of 50 million cubic feet per day of "dry gas" to be produced from the western portion of the Panhandle field in Moore County and adjacent counties in West Texas and from the southern portion of the Hugoton field in Sherman County, Texas, with the right to the El Paso company under certain circumstances to increase its takings of dry gas from the two last mentioned fields up to a maximum of 180 million cubic feet a day.

The El Paso company also contracted with Gulf Oil Corporation for 30 mil-

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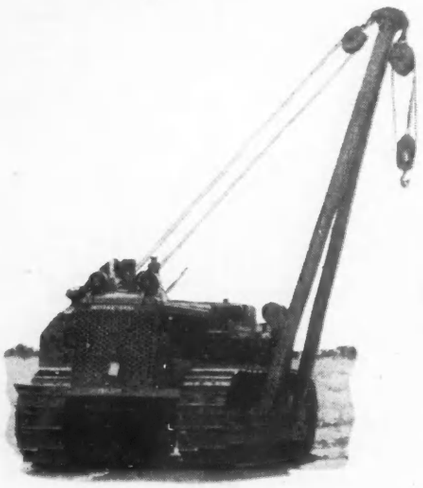

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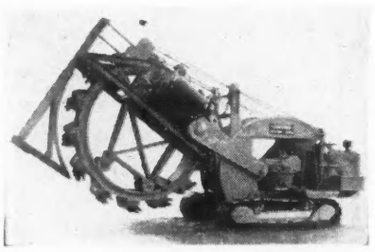

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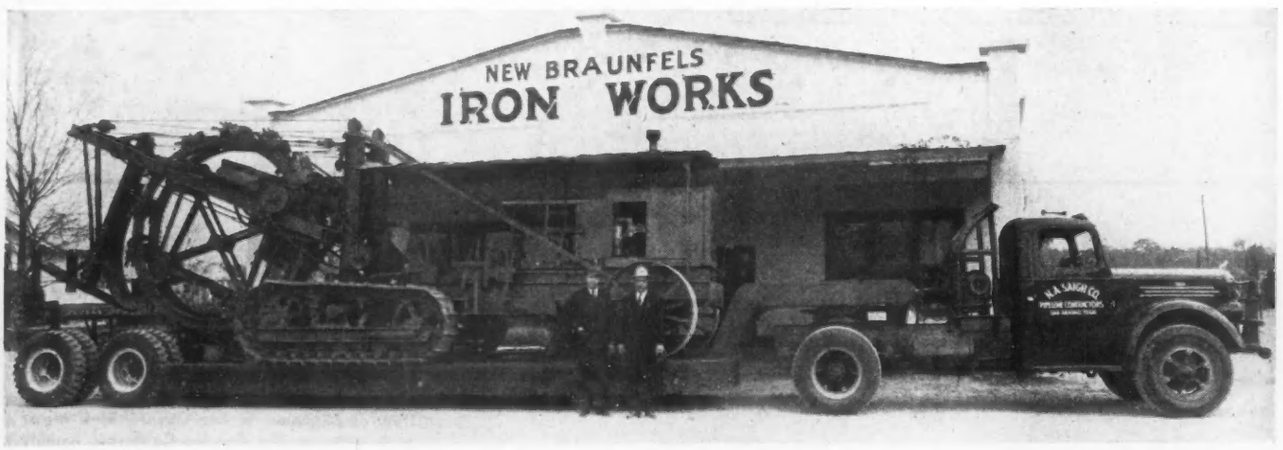

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Centrifugal Pump Flexibility

By JOHN M. McGREGOR, Tulsa

MORE than 15 years ago the writer published an article outlining a proposed installation of centrifugal pumps on pipe lines advancing, at that time, a new suggestion for the operation of motor-driven centrifugal pumps.

The standard practice then, and possibly in most cases to this day, is to have two pumps in series, each pump being similar in every respect to the other. This results in the stations having only two combinations, i.e., one pump operating alone or two pumps in series.

In order to be able to secure a larger selection of operating conditions, it was suggested that three pumps be installed instead of two. The pump on the suction, or up-stream, side of each station would be a single-stage unit with parts designed so that they would be capable of withstanding the maximum residual pressure which might be involved at any station.

For an example, we are assuming a maximum permissible line pressure of 800 pounds per square inch. The accepted practice was to have two units, each operating at 400 pounds per square inch. By adding a single-stage unit at the incoming end of each station and using slightly different diameter impellers in the two multi-stage pumps, we could secure an increased number of pressure combinations.

As an example, assume that we have two multi-stage pumps, one capable of delivering the required capacity at a pressure of 420 pounds per square inch and the other at a pressure of 380 pounds per square inch, each being a duplicate of the other except for different impeller diameters. The third pump (Single-stage) to be capable of delivering the required capacity at a pressure of 100 pounds per square inch.

We thus arrive at seven pressure combinations, the high pressure pump is named "A," the other multi-stage pump, "B," and the single stage pump, "C." We therefore have available at each station the pressure combinations shown in Table 1.

We tried to show later that the available maximum pressure at each station would never exceed the maximum of 800 pounds per square inch, although higher pressures are available. In fact, referring to Table 3 it will be seen that only for one condition, viz. 2200 barrels per hour, is it necessary to have an "A" and "B" in series in the same station. For this condition the pressure at two stations, using an "A" and "B" in series, would be 770 pounds per square inch.

Naturally, the additional single-stage unit would add to the first cost but we believe this increased investment would be repaid due to higher efficiency of station operation.

Engine driven units would be still more flexible due to the large speed variation. For engine drive, having the Line-Characteristic Curve and the Pump Performance Curve, it is an easy matter to make the necessary pump combination calculations.

That an engine-driven centrifugal pipe line using a closed system and speed variation is practical has been absolutely proved on "The Portable Pipe Line" used by the U. S. Army in nearly every theater of war. All the units, whether centrifugal or reciprocating, were engine driven.

TABLE 1

	Pounds per Square Inch	Pounds per Square Inch
A+B+C	420+380+100=	900
A+B	420+380=	800
A+C	420+100=	520
B+C	380+100=	480
A	420=	420
B	380=	380
C	100=	100

TABLE 2

Capacity Bbls./Hour	Friction Loss psi Per Mile	Friction Loss psi 258.3 Miles
1000	3.62	935
1200	4.98	1288
1400	6.54	1690
1600	8.10	2090
1800	9.98	2580
2000	12.10	3128
2200	14.25	3684

TABLE 3

Capacity Barrels/Hour	Pump Selection	Average Eff. Percent	Line Pressure psi	Pump Pressure psi	Residual Pressure psi
1000	2B	72.0	935	−936	1
1200	2B+4C	74.0	1288	1316	28
1400	3A+3C	80.0	1690	1695	5
1600	4A+3C	84.0	2090	2120	30
1800	3A+3B	84.0	2580	2598	18
2000	6A+7C	83.0	3128	3152	24
2200	7A+2B+2C	81.6	3684	3685	1

In order to lay out the proposed scheme quite a number of computations are necessary but this is common with all pipe line problems.

As an example of how our suggestions may be applied, we are using a hypothetical 12-inch line, 258.3 miles long. The deliveries of 38-gravity crude, having a viscosity of 80 Saybolt Universal Seconds, to vary from 1000 to 2200 barrels per hour.

In order to keep within the maximum working pressure of 800 psi, and due to the terrain, we "laid out" seven stations. With these seven installations and the same number of pressure combinations in each, we have 49 pump combinations on the line from which to select the pumps which should be used to secure the required capacity.

In nearly every case a centrifugal pump characteristic curve shows that the pressure decreases as the capacity increases. Anyone familiar with centrifugal pumps knows that this type of unit takes advantage of whatever suction pressure is applied to it, i.e.: if a pump is capable of "putting up" 300 pounds per square inch and 150 pounds per square inch is added to the suction, the total, or additive, pressure will be 450 pounds per square inch. On this established fact we designed our problematical pipe line.

Before "figuring" our line and selecting our pump combinations, it was necessary to plot the "line characteristic" curve. The pressure drop, in increments of 200 barrels per hour, for capacities from 1000 to 2200 barrels per hour, is shown in Column 4, Table 3, and Column 3, Table 2.

After plotting the "pressure-drop" curve we made our pump selections and drew the "head-capacity" curve for each of the three pumps we proposed using; and noting where these curves intersected our "friction loss" curve, we secured capacities and pressures.

Table 2 shows friction loss calculations. These figures may be questioned but they serve as a basis and can be altered readily to meet any company's conditions.

Table 3 details line capacities, pump selections, efficiencies and line, pump and residual pressures.

Table 4 may appear complicated but a brief explanation should suffice.

Column 1 shows the capacity in barrels per hour. The seven columns following give the pressures pumps A, B, C, respectively, will deliver at different capacities. Under "Station 1" is shown the pressures available for different capacities and these figures have been extended through all seven stations.

As an example: Should it be required

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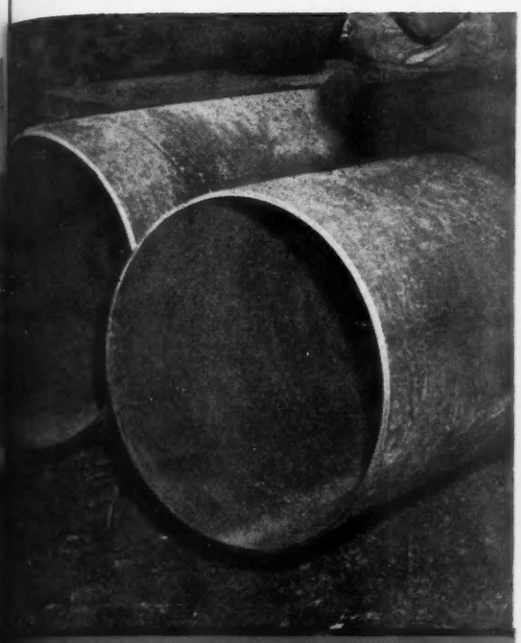

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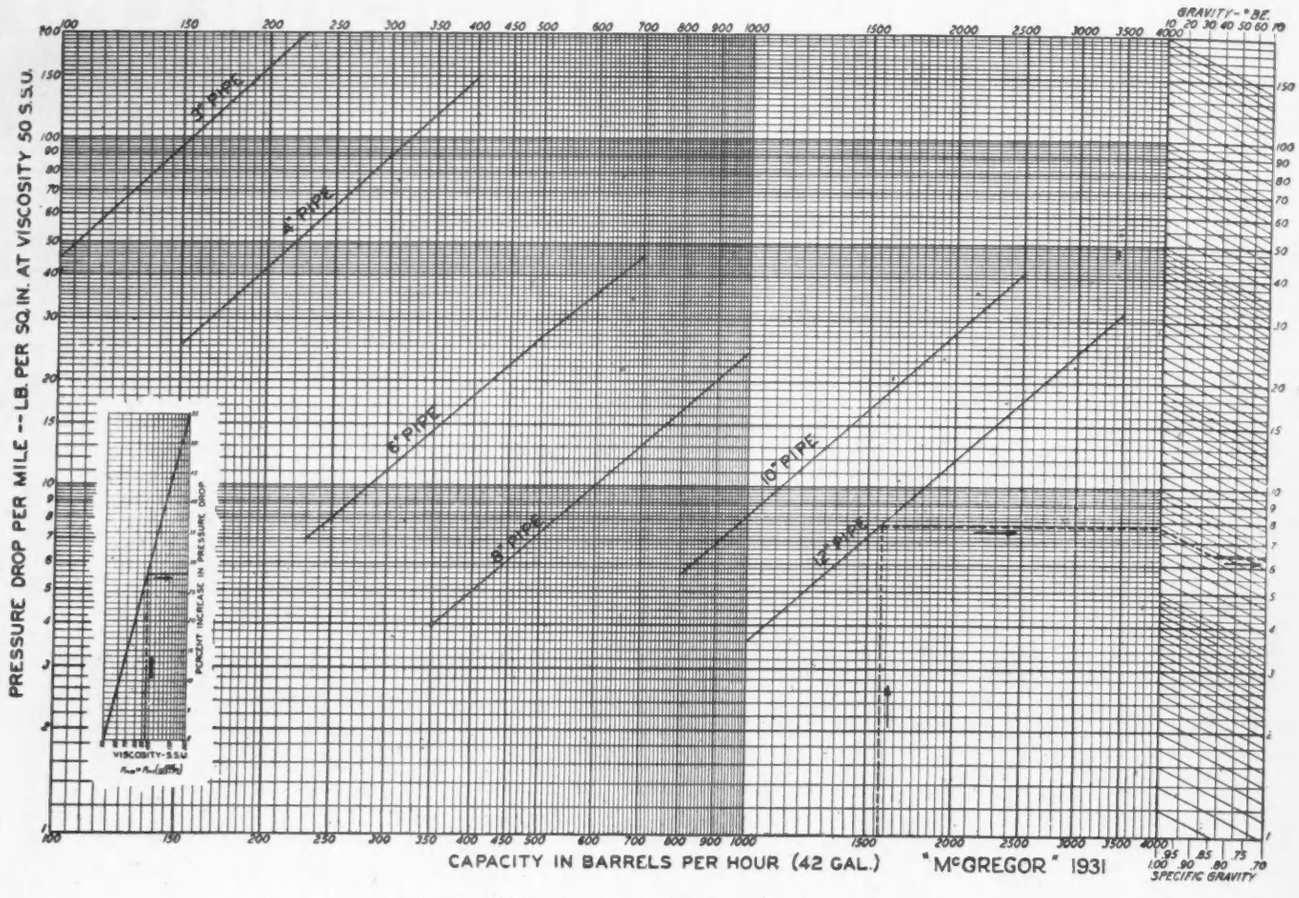

Pipe line friction losses were based on the above curve

TABLE 4

	STATIONS						
	1	2	3	4	5	6	7
Capacity Bbls /Hour	psi	psi	psi	psi	psi	psi	psi
1000	488 468 99	976 936 198	1464 1404 297	1952 1872 396	2440 2340 495	2928 2808 594	3416 3276 693
	1055	2110	3165	4220	5275	6330	7385
1200	480 460 99	960 920 198	1440 1380 297	1920 1840 396	2400 2300 495	2880 2760 594	3360 3220 693
	1039	2078	3117	4156	5195	6234	7273
1400	467 447 98	934 894 196	1401 1341 294	1868 1788 392	2335 2235 490	2802 2682 588	3269 3129 686
	1012	2024	3036	4048	5060	6072	7084
1600	458 438 96	916 876 192	1374 1314 288	1832 1752 384	2290 2190 480	2748 2628 576	3206 3066 672
	992	1984	2976	3968	4960	5952	6944
1800	443 423 94	886 846 188	1329 1269 282	1772 1692 376	2215 2115 470	2658 2538 564	3101 2961 658
	960	1920	2880	3840	4800	5760	6720
2000	422 402 90	844 804 180	1266 1206 270	1688 1608 360	2110 2010 450	2532 2412 540	2954 2814 630
	914	1828	2742	3656	4570	5484	6398
2200	395 375 85	790 750 170	1185 1125 255	1580 1500 340	1975 1875 425	2370 2250 510	2765 2625 595
	855	1710	2565	3420	4275	5130	5985

to deliver 1400 barrels per hour we see that the total line pressure would be 1690 psi. Looking at Table 4 we find the tabulation of pump pressures. Under Column 3, Table 4, we find we could secure a pump pressure for three "A" pumps of 1401 psi and, in the same column for three "C" Pumps, a pressure of 294 psi. As 1690 psi is the required pressure, we would arrive with five psi residual pressure. Similarly, should we be required to increase to the maximum of 2200 barrels per hour we find the total line pressure would be 3684.

In order to make our selection we refer again to Table 4, and find our selections. Table 3 shows these are 7A:2B:2C.

For seven "A" we find a total pressure of 2765 psi; for two "B" it is 750 psi; and, for 2 "C" the pressure is 170 psi. Consequently, as the required pressure is, as previously stated, 3684 psi, we would arrive with one pound residual pressure. We realize this is too close for practical pipe line practice but our intentions are not to calculate a pipe line but merely to suggest an idea where a more economical system could be installed.

We also realize that permissible working pressures have increased. Our hypothetical example is based on 800 psi maximum but, notwithstanding the prescribed conditions, our theory, we believe, would be applicable.

Although not directly involved in our problem we believe it would be well to include some pertinent data relative to engine and pump calculations.

The engine and pump formulae for

■ CONTINUED ON PAGE 143

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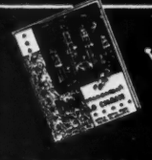

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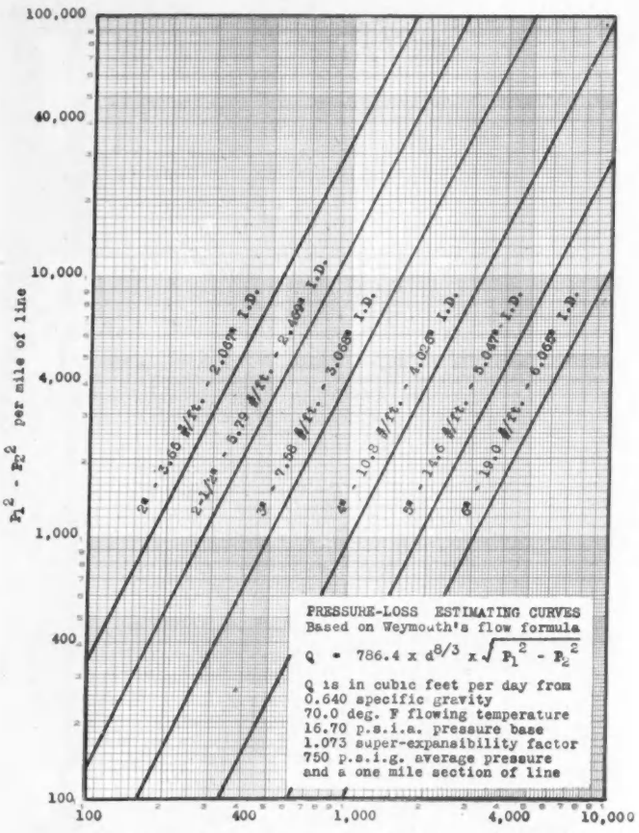


Curve 1. Q gas volume in thousand cubic feet per day (mcfd).

Correct sizing of gas lines in the oil field presents an economic and engineering problem

BY G. R. ADAMS
Associated Engineers, Houston

CORRECT sizing of gas lines in the oil field is an economic as well as an engineering problem for the operator. The cost of these lines must be in balance with the cost of compressors or high pressure equipment at the inlet end of the gas line.

Since "in the ground" pipe costs rise directly with the actual pounds weight per foot, economics demand that the size and thickness of the pipe be as small as practical. The smallest size pipe that will carry the expected load without excessive pressure loss, and the thinnest walled pipe that will withstand the highest pressure that ever will be put on the line, should be the correct one to use..

Undersized Lines

Excessive pressure loss can be expensive in several ways. For example, suppose we have a 40-pound absorption gasoline plant and want to sell surplus flare gas to a nearby main gas transmission line operating at 750 pounds per square inch gauge. A small under-sized lateral line, that has an excessive pressure loss, will require a higher compressor discharge pressure at the gasoline plant. The necessary operation and maintenance cost of this additional compressor horsepower may soon exceed the savings realized on the cost of the small-sized line.

Undersized lines from flowing wells will restrict production and may raise pressures up to hydrate forming conditions where the lines will plug up and cut off all production. Undersized injection systems will limit the pressure that can be put on each well and, as a result, the input potential capacity of these wells will be lowered.

On low pressure oil field separators, larger gathering system lines will allow lower separator operating pressures and a richer gas for the gasoline plant inlet stream.

Required Wall Thickness

The wall thickness required to hold the expected pressure can be calculated from

$$t = \left(\frac{P \times O.D.}{2S} + 0.05 + a\right) \quad 1.143$$

where

t = wall thickness in inches
P = maximum allowable working pressure in p.s.i.g.
O.D. = outside diameter of pipe in inches.
S. = allowable stress for the operating temperature. A value of 26,250 psi may be used for Grade "B" seamless pipe of ASTM-A 106-42 T specifications. This value is 75 percent of the 35,000 psi yield point and is good in outside refinery service at 100° F.
0.05 = an arbitrary minimum corrosion allowance, measured in inches.
a = threading allowance with a value of no inches for welded joint pipe and 0.100 or 0.0696 inches for eight or 11½ threads per inch.
1.143 = correction factor for the permissible mill tolerance of 12.5 percent under nominal wall thickness.

Line Sizing Curves

With the five accompanying line sizing curves, the operator can quickly determine the correct size of line needed to carry his gas if he knows two of the three interrelated variables. "Q_d" is the volume of gas that will flow through the pipe line from "P_1" pressure at Station 1 to "P_2" pressure at Station 2. The resulting pressure loss will be "$P_1 - P_2$".

Curves 1 and 2 are calculated from Weymouth's Flow Formula for a gas of 0.640 specific gravity, 70.0° F. flowing temperature, 16.70 psia pressure base, 1.073 super-expansibility meter factor (for a 750 psig average line pressure), and for a one-mile section of line.

Curves 3 and 4 are calculated from Oliphant's Flow Formula for a gas of 0.700 specific gravity, 70.0° F. flowing temperature, 14.65 psia pressure base, 1.008 super-expansibility meter factor (for a 55 psig average line pressure), and for a 1000-foot section of line.

Curve 5 is a pressure-loss set of curves for a line-sizing design value of ⅛, ¼, ½, and 1-pound pressure loss per 100 feet of pipe. Compressor suction and discharge lines, with their respective headers (at least for the length of the compressor house), are calculated for the ⅛-pound loss per 100 feet. Plant headers and branch lines are figured for the ¼-pound loss per 100 feet. General gas and vapor piping around plant yards are computed for the ½-pound

# of Natural Gas Lines

loss per 100 feet. Field gathering and injection systems are usually sized to the actual $P_1 - P_2$ per 100 feet imposed upon the operator by his actual plant or field operating conditions. A pressure loss of ½ to 1 pound per 100 feet is an average value for quick estimations. The values in Curve 5 using Weymouth's formula are for a 750 psig average pressure while those using Oliphant's formula are for a 55 psig average pressure.

How to Use the Line Sizing Curves

Take, for example, a low pressure gasoline plant with 40-pound absorbers and 25 m-mcfd (million cubic feet per day) of flare gas that the operator desires to sell to a nearby 750 psig main gas transmission line. The compressor discharge pressure must be high enough to allow for pressure losses in plant lines or vessels and then still have P_1 pressure at the inlet of the lateral gas line. The pressure loss in the line itself will be $P_1 - P_2$ where P_2 is the pressure required to kick into the main gas transmission line. On Curve 5, using Weymouth's ½ pound per 100 foot pressure-loss line, we find that 25 m-mcfd will require a 6.7-inch inside diameter line. Thus, the correctly sized field line for this volume of gas probably will be six inches or eight inches.

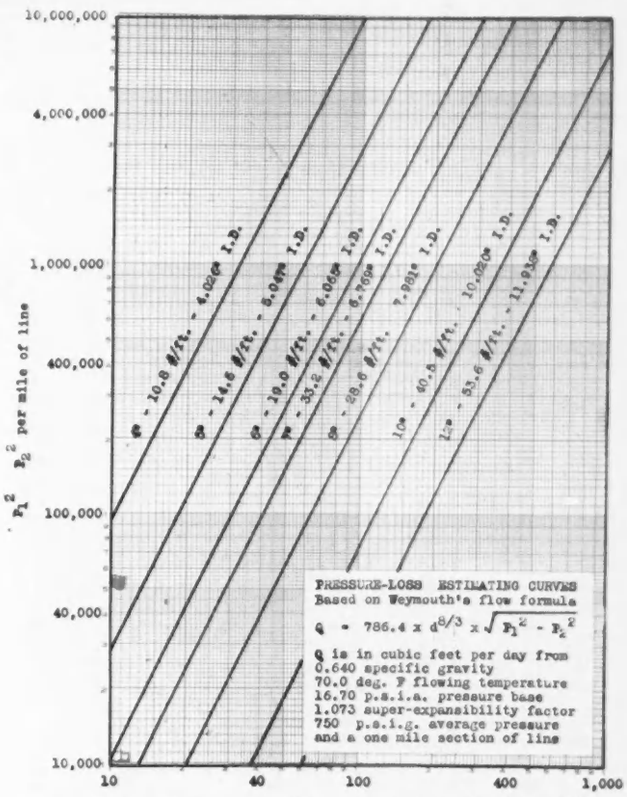
As a check on this approximate 6.7-inch ID, take 20 miles as the line length, 750 psig as the value of P_2, use Weymouth's Flow Formula as presented by Curve 2, and solve for P_1, the required line inlet pressure.

We have $P_1^2 = P_2^2 + (P_1^2 - P_2^2)$

then $P_1^2 = (750 + 15)^2 + (P_1^2 - P_2^2$ per mile$) \times (20$ miles$)$

Calculating P_1 For A Four-Inch Line

where a
$P_1^2 - P_2^2$ value of 599,000 per mile is read from the curve for the 25 m-mcfd flow rate.
we have
$P_1^2 = (765)^2 + (599{,}000 \times 20)$
or
$P_1^2 = 585{,}200 + 11{,}980{,}000 = 12{,}565{,}000$
and
$P_1 = 3{,}545$ psia or 3,530 psig.
This compressor pressure is too high and the four-inch line is too small for this volume of gas flowing for a 20-mile distance.



Curve 2. Q gas volume in million cubic feet per day (m-mcfd).

Calculating P_1 For A Six-Inch Line

where
$P_1^2 - P_2^2 = 67{,}400$ per mile
then
$P_1^2 = (765)^2 + (67{,}400 \times 20)$
or
$P_1^2 = 585{,}200 + 1{,}348{,}000 = 1{,}933{,}200$
and
$P_1 = 1390$ psia or 1375 psig.
This compressor discharge pressure is reasonable and a balance of line costs with compression costs may indicate that this is the economically correct size of line to use. If the pressures go above the 1000-pound limit of the schedule 40 pipe that was used in computing the pressure-loss curves, the thicker walled line of smaller ID will have a larger $P_1^2 - P_2^2$ pressure loss and will require a higher input pressure P_1. Both the heavier pipe and the raised compressor pressures will increase the cost of this 6-inch installation.

Calculating P_1 For An Eight-Inch Line

where
$P_1^2 - P_2^2 = 15{,}590$ per mile
then
$P_1^2 = (765)^2 + (15{,}590 \times 20)$
or
$P_1^2 = 585{,}200 + 311{,}800 = 897{,}000$
and
$P_1 = 947$ psia or 932 psig.
Here the compressor discharge pressure is very satisfactory but the additional cost of an eight-inch over a six-inch line may outweigh the savings realized by reducing the line inlet pressure from 1375 (or more) to 932 psig. Another factor to consider is the length of time the 25 m-mcfd gas volume will be available for sale before the field starts to decline and the gas volume drops off to 20 or 15 m-mcfd.

Low Pressure Gathering Systems

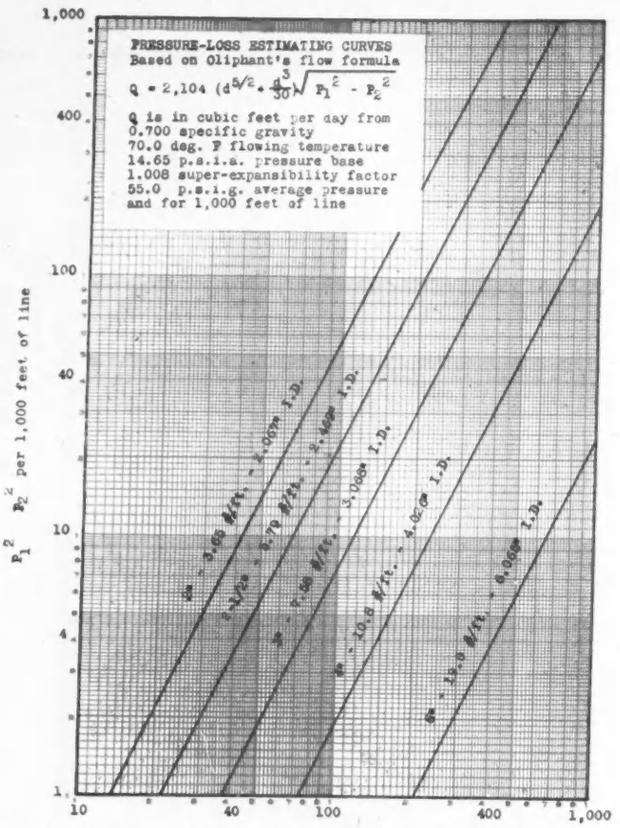
Oliphant's Flow Formula as presented in Curves 3 and 4 is used for calculating line sizes on low pressure or vacuum gathering systems. In determining gas flow, the predicted life and average producing rate of the field is first tied down, then from the known or probable gas-oil ratio, the estimated gas production per day is assigned each present or future tank battery. The main gathering line arteries are plotted to the highest gas producing areas where laterals are then projected to each lease.

40-Pound Plant, 70-Pound Field Separators

As the plant intake pressure has been taken at 40 psig and the maximum desired pressure on the field, separators has been set at 70 psig, the maximum $P_1^2 - P_2^2$ line loss will be
$(84.65)^2 - (54.65)^2$ or $7166 - 2987$
or 4179. This 4179 pressure-loss $P_1^2 - P_2^2$ divided by the 1000-foot lengths of each main gathering line will give the average pressure-loss per 1000 feet. This average $P_1^2 - P_2^2$ on the left side of pressure-loss Curves 3 and 4 will quickly give the approximate sized line for each desired quantity of gas. For a two-mile distance to the edge of the field, the average $P_1^2 - P_2^2$ would be the 4179 divided by 10.56 or 395.7 per 1000 feet. For a five-mile line, the average $P_1^2 - P_2^2$ would be 4179 divided by 26.40, or 158.3 per 1000 feet.

Curve 5 will give field line ID sizes (using Oliphant's formula) for corresponding gas volumes on the ½-pound $P_1 - P_2$ per 100 feet.

In the 70 to 40 psig pressure conditions the two-mile length of line would have 70-40 (or 30 pounds) divided by 105.60 hundred feet for a 0.284 pounds pressure loss per hundred feet. A five



Curve 3. Q gas volume in thousand cubic feet per day (mcfd).

mile length of line would have 30 pounds divided by 264.00 hundred feet or only 0.114 pounds per hundred feet. While the 0.284 $P_1 - P_2$ figure corresponds to design conditions for plant headers and branch lines, the 0.114 pressure-loss value is less than the ⅛-pound recommended for compressor suction and discharge.

Usually three sets of line sizes are worked up for the final decision on what pipe to order. After the calculated, a low, and a high gas volume have been assigned each branch and main gathering line, the pressure-loss determinations are started at the 40 psig plant inlet (P_2 then is 54.65 psia) and worked back to the tank battery separators to find each P_1 (or P_1^2) value.

Tabulation of Pressure From Plant to Separators

Three tables with the following headings can be compiled:

1. Identify each section of line by numbers, letters, or lease initials to mark junction points or tank battery separators;
2. Give length of each section in thousand feet;
3. State volume of gas flowing through the line;
4. Read $P_1^2 - P_2^2$ pressure loss per thousand feet from the curves;
5. Calculate the $P_1^2 - P_2^2$ pressure loss in each section of line;
6. Carry running total of P_2^2 plus the total $P_1^2 - P_2$ pressure losses to the inlet end of the line section;
7. Determine the actual junction point or tank battery separator pressure in psia, and then;
8. Indicate the above junction point or tank battery separator pressure in psig as the final answer.

Construction Of Pressure-Loss Curves

To construct a set of pressure-loss curves for an average Gulf Coast gas line of 500 to 1000 pounds operating pressures, use schedule 40 grade "B" line pipe, as this weight is good for this pressure range (outside refinery specifications) in the two-inch through the 12-inch sizes.

The following operating conditions are used as average:

16.70 psia =
the usual field contract pressure base consisting of the 14.70 psia atmospheric pressure plus a 2.00-pound sales contract factor.

0.640 sp. gr. =
an average specific gravity for gas from an oil field separator. This 0.640 specific gravity value is on the conservative side as a value of 0.620 substituted in Weymouth's formula (for the same volume of gas) would indicate a smaller pressure-loss under ideal conditions of clean pipe and no condensation in the low spots.

70.0° F. =
an average yearly flowing temperature for the Gulf Coast. This 70.0° F, like the specific gravity value, is also on the conservative side as a value of 65.0° F, or 60.0° F, in the calculations would allow more gas through the line for any set of pressure-loss conditions.

750 psig =
average design pressure between the 500 and 1000 pound range.

Weymouth's Basic Formula

From Monograph 6, U. S. Department of the Interior, "Flow of Natural Gas Through High - Pressure Transmission Lines," on page 25, Table 5, the standard flow formula for Weymouth's basic coefficient is

$$Q \text{ (hour)} = 36.926 \times (d)^{8/3} \times \sqrt{\frac{P_1^2 - P_2^2}{L}}$$

and for a 24-hour day this becomes

$$Q \text{ (day)} = 886.22 \times (d)^{8/3} \times \sqrt{\frac{P_1^2 - P_2^2}{L}}$$

for 0.600 gravity, 60.0° F. flowing temperature, 14.40 psia pressure base, and unity super-expansibility factor.

Weymouth's flow formula with the gravity, temperature, pressure base, and super-expansibility corrector factors now becomes

$$Q_d = 886.22 \times (d)^{8/3} \times \sqrt{\frac{P_1^2 - P_2^2}{L}} \times \sqrt{\frac{0.600}{G}} \times \sqrt{\frac{520}{T}} \times \frac{14.40}{P_b} \times \sqrt{\frac{1}{Z}}$$

where

Q_d = standard cubic feet per day (c.f.d.) at 0.600 gravity, 60.0 degree F temperature, 14.40 p.s.i.a pressure base, and unity super-expansibility factor.

d = inside diameter of pipe in inches

TABLE 1

Weymouth's Flow Formula

Nominal Pipe Size in Inches	Actual Inside Diameter in Inches	$(d)^{8/3}$ or $(d)^{2.667}$	Q Volume in mcfd for $P_1^2 - P_2^2 = 100$	Q Volume in m-mcfd for $P_1^2 - P_2^2 = 10{,}000$	Q Volume in m-mcfd for $P_1^2 - P_2^2 = 1{,}000{,}000$
2	2.067	6.933	54.52	0.545	5.45
2½	2.469	11.136	87.57	0.876	8.76
3	3.068	19.87	156.3	1.56	15.6
4	4.026	41.02	322.6	3.23	32.3
5	5.047	74.95	589.4	5.89	58.9
6	6.065	122.34	962.1	9.62	96.2
7	6.769	164.0	1290	12.9	129
8	7.981	254.4	2001	20.0	200
10	10.020	466.6	3669	36.7	367
12	11.938	744.4	5854	58.5	585

P_1 = absolute pressure of the upstream or inlet end of the pipe line in psia

P_2 = absolute pressure of the downstream or outlet end of the pipe line in psia.

L = length of the line section in miles

G = specific gravity of the gas flowing through the line

T = absolute temperature of gas in degrees R

P_b = pressure base at which the gas is measured in p.s.i.a.

Z = compressibility factor

$\sqrt{\frac{1}{Z}}$ = super-expansibility meter factor

psia = pounds per square inch absolute pressure

psig = pounds per square inch gauge pressure

mcfd = thousand cubic feet of gas per day

m-mcfd = million cubic feet of gas per day

Weymouth's Flow Formula For Given Conditions

Correction factors are calculated as follows:

0.640 gravity =

$$\sqrt{\frac{0.600}{0.640}} = \sqrt{0.9375} = 0.9682$$

70.0 degrees F. =

$$\sqrt{\frac{520}{530}} = \sqrt{0.9811} = 0.9905$$

16.70 pressure base = $\frac{14.40}{16.70} = 0.8623$

The 0.869 compressibility factor is obtained from G. G. Brown's[4] curves for a 1.432 pseudo-reduced temperature (from 530/370) and a 1.142 pseudo-reduced pressure (from 765/670).

The super-expansibility meter factor for a 0.640 gravity, 70.0° F (530 degrees R), and an average line pressure of 750 pounds is calculated as detailed in the "Natural Gas Super-expansibility Meter Factors" article in THE OIL WEEKLY of March 18, 1946, and is equal to

$$\sqrt{\frac{1.000}{0.869}} = \sqrt{1.1507} = 1.073.$$

A one-mile length of line is equal to

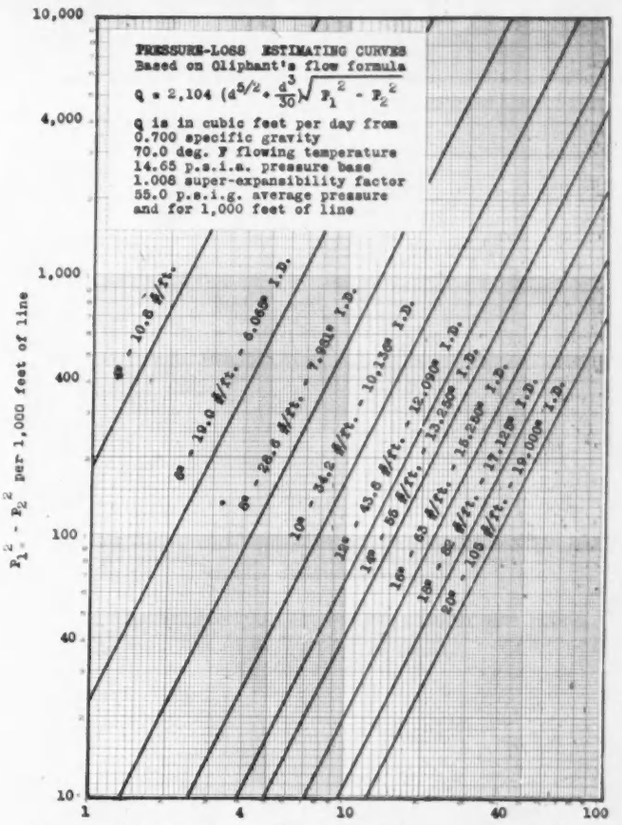
$$\frac{1}{\sqrt{1.000}} = \sqrt{1.000} = 1.000$$

The new constant now becomes $886.22 \times 0.9682 \times 0.9905 \times 0.8623 \times 1.073 \times 1.000 = 786.4$

Then Weymouth's formula for a one-mile section of line is

$$Q_d = 786.4 \times (d)^{8/3} \times \sqrt{P_1^2 - P_2^2}$$

Table 1 gives the mechanical tabulation of data for Curves 1 and 2. Calculations are made for $P_1^2 - P_2^2$ equal to 100, 10,000, and 1 million and the gas volumes are plotted on logarithmic paper at these three values. Schedule 40 line pipe is used for all sizes except a special weight seven-inch.



Curve 4. Q gas volume in million cubic feet per day (m-mcfd).

Operating Volumes Converted to Curve Specifications

The operator may convert his gas volumes (that actually have different gravity, temperature, pressure base, or super-expansibility meter factors) to these of the pressure-loss curve specifications by a single conversion factor. This multiplier is equal to

$$\sqrt{\frac{0.640}{\text{actual G}}} \times \sqrt{\frac{530}{\text{actual deg. R}}} \times \frac{16.70}{\text{actual pres. base}} \times \sqrt{\frac{0.869}{\text{acutal Z}}}$$

the actual Z is calculated for the average line pressure, the actual gravity, and the actual average temperature.

As an example, take a gas of 0.620 gravity, 55.0 degree F average temperature, 14.40 psia plus 2.00 pounds (a total of 16.40 psia) pressure base and an average line pressure of 550 pounds, then the conversion factor would be:

$$\sqrt{\frac{0.640}{0.620}} \times \sqrt{\frac{530}{515}} \times \frac{16.70}{16.40} \times \sqrt{\frac{0.869}{0.898}}$$

and the multiplier is

$1.0160 \times 1.0144 \times 1.0183 \times 0.9837 = 1.0324$

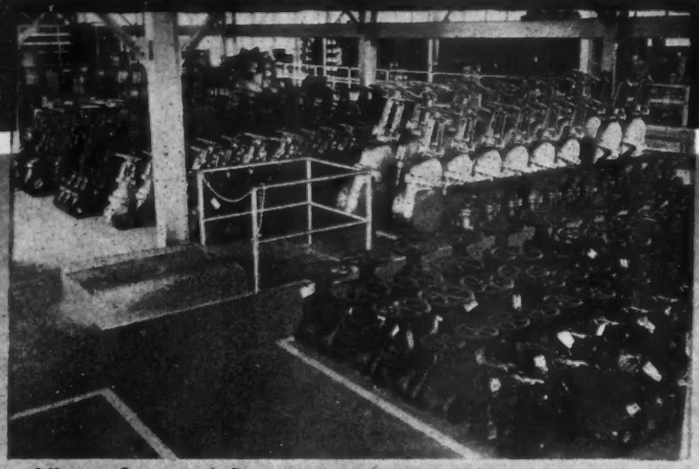
therefore, all gas volumes would be multiplied by the 1.032 conversion factor to get the equivalent gas volume at the curve specifications.

TABLE 2

Oliphant's Flow Formula

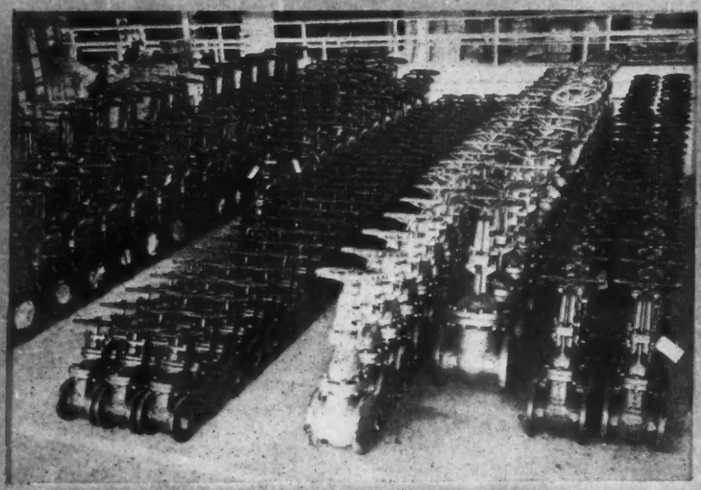
Nominal Pipe Size in Inches	Actual Inside Diameter in Inches	$(d)^{5/2}$ or $(d)^{2.500}$	$(d)^3$	$\frac{(d)^3}{30}$	$\frac{(d)^{5/2}}{(d)^3}$ Plus $\frac{(d)^3}{30}$	Q Volume in mcfd for $P_1^2-P_2^2=1$	Q Volume in m-mcfd for $P_1^2-P_2^2=100$	Q Volume in m-mcfd for $P_1^2-P_2^2=10{,}000$
2	2.067	6.143	8.831	0.294	6.437	13.55	0.136	1.36
2½	2.469	9.579	15.051	0.502	10.081	21.21	0.212	2.12
3	3.068	16.487	28.88	0.963	17.45	36.72	0.367	3.56
4	4.026	32.52	65.26	2.18	34.70	73.02	0.730	7.30
6	6.065	90.59	223.1	7.44	98.03	206.3	2.06	20.6
8	7.981	179.95	508.4	16.95	196.9	414.3	4.14	41.4
10	10.136	327.1	1041.4	34.7	361.8	761.3	7.61	76.1
12	12.090	508.2	1767.2	58.9	567.1	1193	11.93	119.3
14	13.250	639.1	2326	77.5	716.6	1508	15.1	151
16	15.250	908.2	3547	118.2	1026.4	2160	21.6	216
18	17.125	1213.6	5022	167.4	1381	2906	29.1	291
20	19.000	1573.6	6859	228.6	1802	3792	37.9	379

A SUPPLY SERVICE as



View of second floor valve department at Republic's new Houston store

A section through the plug valve department



Another section of valve department showing assortment of various sizes

Close-up view showing method for handling fittings and shelf hardware

Partial view of flange stocks

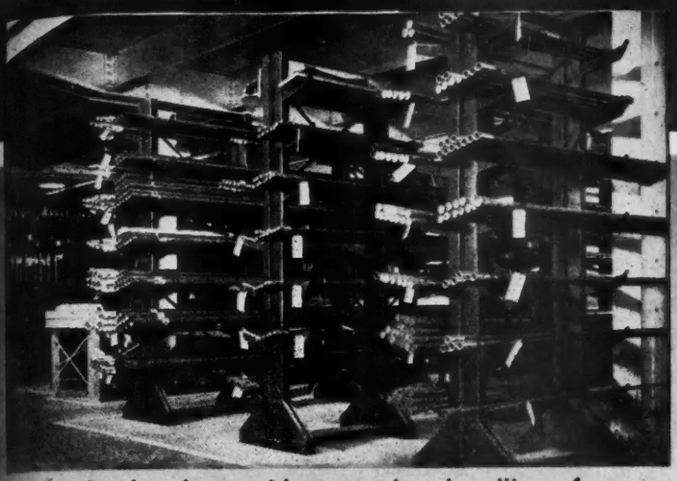
Welding fittings department

REPUBLIC SALES AND SERVICE POINTS

ARKANSAS—El Dorado, Patmos; ILLINOIS—Chicago, McLeansboro, Salem; INDIANA—Griffin; KANSAS — Ellinwood, Russel, Wichita**; LOUISIANA — Haynesville, New Iberia, Rodessa, Shreveport*; MISSISSIPPI—Jackson, Natchez ***; NEW MEXICO—Hobbs; OKLAHOMA—Cement, Oklahoma City, Seminole, Tulsa**; TEXAS—Alice, Big Spring, Borger, Columbus, Corpus Christi, Dallas**, Electra, Falfurrias, Fort Worth**, Hebbronville, Houston*, Kenedy, Kermit, Kilgore, Nocona, McAllen, Monahans, Odessa*, Olney, Pampa, San Antonio**, Sundown, Talco, Victoria, Wichita Falls*.**

* District Offices and Stores ** Sales Office *** Pipe Depot

Modern as Tomorrow!



Steel racks provide convenient handling of sub-surface pumping equipment

Looking north along east aisle of main floor. Plant has more than 37,000 square feet of space

Battery of Roto bins for miscellaneous items

Balcony arrangement adds to space and handling efficiency

REPUBLIC'S first unit* of their new central warehouse and store in Houston is being acclaimed by oil men who have visited it as the "last word" in modern oil country supply service.

Here have been organized the finest equipment, the newest methods and a capable staff to provide efficient warehousing and quick distribution of quality oil equipment and materials.

This new facility is but another step in REPUBLIC'S program to build and maintain at all times the best possible supply service for the oil and gas industry.

For everything best in products and service depend on REPUBLIC . . . ***Your Supply Store.***

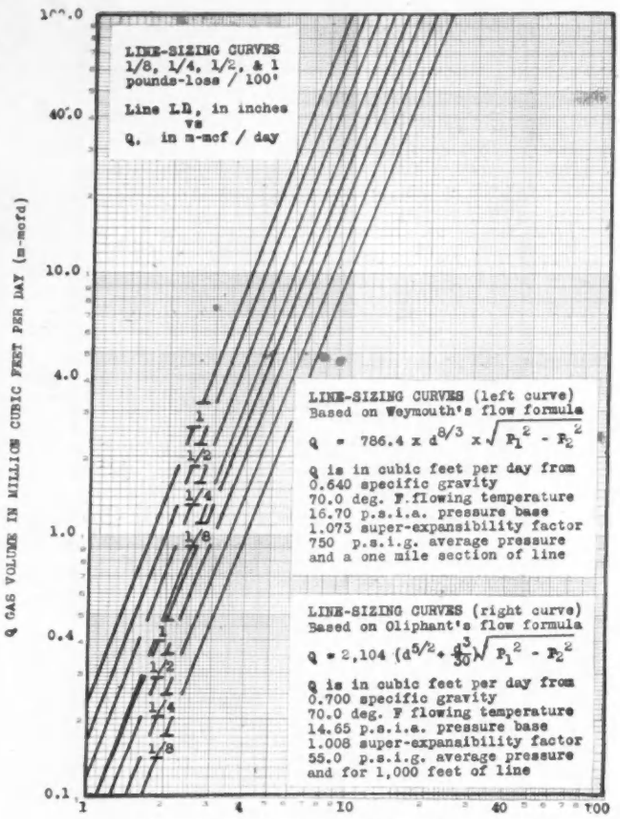
** A second unit on the company's 14 acre tract will house heavy machinery and tubular goods.*

Republic Supply COMPANY

GENERAL OFFICES · · · HOUSTON 1, TEXAS

REPUBLIC STEEL

Reg. U. S. Pat Off.



Curve 5. Line inside diameter in inches.

Oliphant's Basic Formula

From Monograph 6 the standard flow formula for Oliphant's basic coefficient is

$$Q_{(hour)} = 42\left(d^{5/2} + \frac{d^3}{30}\right)\sqrt{\frac{P_1^2 - P_2^2}{L}}$$

and for a 24-hour day with L equal to 1000 feet, this becomes

$$Q_{(day)} = 2{,}316\left(d^{5/2} + \frac{d^3}{30}\right)\sqrt{P_1^2 - P_2^2}$$

for 0.600 gravity, 60.0 degree F flowing temperature, 14.40 psia pressure base, and unity super-expansibility factor.

Converting this basic coefficient, as we did Weymouth's, the correction factors are calculated as follows:

0.700 gravity =

$$\sqrt{\frac{0.600}{0.700}} = \sqrt{0.8571} = 0.9258$$

70.0 deg. F. =

$$\sqrt{\frac{520}{530}} = \sqrt{0.9811} = 0.9905$$

14.65 pres. base $= \frac{14.40}{14.65} = 0.9829$

The 0.984 compressibility factor is obtained from G. G. Brown's[2] curves for a 1.375 pseudo-reduced temperature (from 530/385) and a 0.1045 pseudo-reduced pressure (from 69.65/667).

The super-expansibility meter factor for a 0.700 gravity, 70.0 degrees F (530 degrees R), and an average line pressure of 55.0 pounds is equal to

$$\sqrt{\frac{1.000}{0.984}} = \sqrt{1.0161} = 1.008$$

The 1000-foot length of line factor already has been incorporated into the 2316 daily coefficient, as derived from the 42 hourly coefficient when L is in miles—

from

$$\frac{42 \times 24 \text{ hours}}{\sqrt{(1{,}000/5{,}280) \text{ miles}}} = \frac{1008}{0.4352} = 2{,}316.2$$

The new equation constant now becomes $2{,}316.2 \times 0.9258 \times 0.9905 \times 0.9829 \times 1.008 = 2{,}104$.

Then Oliphant's formula for a 1000-foot section of line is

$$Q_d = 2{,}104\left(d^{5/2} + \frac{d^3}{30}\right)\sqrt{P_1^2 - P_2^2}$$

Table 2 gives the mechanical tabulation of data for Curves 3 and 4. Calculations are made for $P_1^2 - P_2^2$ equal to 1, 100, and 10,000 and the gas volumes are plotted on logarithmic paper at these three values. Schedule 40 line pipe is used for the two through eight-inch sizes and Schedule 30-line pipe is used for the ten through 20-inch sizes.

Line-Sizing For Given Pressure-Losses

Pressure-losses of ⅛, ¼, ½, and 1 pound per 100 feet of pipe, as presented in Curve 5, are derived from Weymouth's and Oliphant's basic flow formulas.

Working a sample calculation to get the reduced formula for general gas and vapor piping around plant yards, values of ½-pound per 100 feet, or five pounds per 1000 feet, or 26.40 pounds per mile have been found satisfactory.

Weymouth's basic formula as used in Curve's 1 and 2 is

$$Q = 786.4 \times (d)^{8/3} \times \sqrt{P_1^2 - P_2^2}$$

and as

$$P_2 = P_1 - 26.40$$

so

$$P_2^2 = P_1^2 - 2 \times P_1 \times 26.40 + (26.40)^2$$

and

$$P_1^2 - P_2^2 = P_1^2 - P_1^2 + 2 \times P_1 \times 26.40 - (26.40)^2$$

then

$$P_1^2 - P_2^2 = (P_1 - 13.20) \times 52.80$$

and

$$Q_d = 786.4 \times (d)^{8/3} \times \sqrt{P_1 - 13.20} \times \sqrt{52.80}$$

or

• CONTINUED ON PAGE 143

TABLE 3
Weymouth's Flow Formula

Pressure Loss in Pounds per 100 Feet	Q Volume in m-mcfd for 2-inch Where $(d)^{8/3}=6.933$	Q Volume in m-mcfd for 4-inch Where $(d)^{8/3}=41.02$	Q Volume in m-mcfd for 8-inch Where $(d)^{8/3}=254.4$	Q Volume in m-mcfd for 12-inch Where $(d)^{8/3}=744.4$
⅛	0.5467	3.234	20.06	58.70
¼	0.7715	4.565	28.31	82.84
½	1.086	6.428	39.86	116.6
1	1.523	9.012	55.89	163.5

TABLE 4
Oliphant's Flow Formula

Pressure Loss in Pounds per 100 Feet	Q Volume in m-mcfd for 2-inch Where $(d)^{5/2}+\frac{(d)^3}{30}=6.437$	Q Volume in m-mcfd for 4-inch Where $(d)^{5/2}+\frac{(d)^3}{30}=34.70$	Q Volume in m-mcfd for 8-inch Where $(d)^{5/2}+\frac{(d)^3}{30}=196.9$	Q Volume in m-mcfd for 16-inch Where $(d)^{5/2}+\frac{(d)^3}{30}=1026.4$
⅛	0.1779	0.9591	5.442	28.37
¼	0.2505	1.350	7.661	39.94
½	0.3509	1.892	10.73	55.96
1	0.4870	2.625	14.90	77.66

Economic Pattern Of Oil Pipe Lines

By G. L. SHANKS, The Pure Oil Company

FROM the most recent authoritative figures published on oil pipe line mileage in the petroleum industry the following summary may be made for the year 1944:

Crude Oil Lines

	Total	Not Reporting to ICC	Reporting to ICC	
			Miles	Percent of Total
Trunk.....	70,324	11,053	59,271	84.3
Gathering...	56,714	13,435	43,279	76.2
Total...	127,038	24,488	102,550	80.7

Products Lines

Trunk	14,752	5,686	9,066	61.5
Grand Total	141,790	30,174	111,616	78.6

Since slightly over 75 percent of the industry mileage is regulated as common carriers by the Interstate Commerce Commission and the industry is thereto required to report financial and operating data yearly, it would seem fair to assume that a review of these data would indicate economic trends that could be taken as representative of the entire oil pipe line industry.

Since 1918 a prescribed sworn report, familiarly known as Form P, has been rendered to the ICC on or before March 31 each year by each common carrier, summarizing its financial status as of the previous December 31 and the main operating results for the past calendar year. Beginning in 1937 there has been included among the operating data a statement as to the total barrel-miles pumped during the year through trunk lines only. The same information is available, however, for the previous years back to 1929, in the evidence presented to the ICC in the hearings on its case No. 26570, known as the Pipe Line Rate Case. This evidence shows the result of a questionnaire sent to practically all the larger carriers and is summarized in the record on the case.

With such basic data as trunk barrel-miles now available for a period of 16 years (including 1944) as well as corresponding revenue and cost figures, it is possible to condense results in the form of Table 1 and Figure 1. The most striking feature, seen best on Figure 1, is the tremendous drop in operating revenue per barrel-mile during the 16-year period. The sharpest and longest decline began in 1936 and still persists. In trying to account for this it should be noted that it may be more than a coincidence that the ICC on December 23, 1940, issued an order (Docket No. 26570) to 17 leading pipe lines to show cause why their tariff rates should not be lowered to produce revenue 65 percent of that derived from tariffs as of December 31, 1935. This "show cause" order was issued after receiving a report by Examiner Kelly of the Commission staff and may not have the only cause of the tariff reductions that followed but it undoubtedly exerted a strong influence. A study of Table 1 and Figure 1 indicates that the chief cause of the drop in operating unit revenue per barrel-mile was the increase in trunk barrel-miles. Barrel-miles in 1944 were 243 percent of those in 1929, yet operating revenue dollars increased only 12 percent, causing operating revenue per barrel-mile in 1944 to drop to 51 percent of the unit for 1929.

Since unit revenue is declining toward unit of total expense at such an alarming rate the all important questions become:

1. The probable trend of unit revenue.
2. Whether or not the unit of total expense will ever rise to a point equal to the revenue unit and, if so, when?

The declining differential between the two units can be arrested in only two ways, either by an absolute increase in tariff rates or by an absolute decrease in the total unit expense.

It does not seem probable that tariff rates will be increased appreciably in the near future. Government policy and natural competition both seem to be against that. It would seem equally probable that rates will not decrease much more. It is possible, however, that the barrel-mile load for the industry may drop somewhat in the next few years, until reconversion is complete.

Lowering Expense

Lowering the total unit expense remains, therefore, as the main hope against overall (statistical) bankruptcy in the near future. There is more hope in this direction than in getting enough increase in tariff rates. Better pipe and equipment, more efficient pumping practice, improvement in batching technique, higher oprating pressures, more and better inhibitors, and reduction in corrosion loss are some of the items now being intensively studied by alert pipe line managements and it stands to reason that so much study and effort must bring forth some fruitful results.

Break-even timing, or the determination of the year according to present trends, when unit revenue will equal total expense, is difficult to predict but it does seem possible to say that, if known conditions do not change too much, the two critical lines on Figure 1 will not meet or cross in the near future, at least, due to improvement in pipe line technology and other causes with resultant reductions in operating cost. However, it may well become a race between lowering costs due to technological advances and raising costs due to increases in wage rates.

The main reason for hedging in the above prediction is the fact that on the present oil pipe line horizon there is an

TABLE 1

Oil Pipe Lines Reporting to Interstate Commerce Commission

YEAR	Trunk Barrel-Miles	Operating Revenue	TOTAL							UNIT PER TRUNK BARREL-MILE				
			Expenses	Taxes	Expenses Less Taxes	Depreciation	Expenses Less Taxes and Deprec.	Employee Compensation	Expenses Less Tax, Dep. and Emp. C.	Operating Revenue	Total Expenses	Total Exp. Less Taxes	Total Exp. Less Taxes and Dep.	Employee Compensation
1929.....	208,668,619,073	$251,410,920	$115,990,148	$13,888,905	$102,101,243	$37,300,264	$64,800,979	$46,251,004	$18,549,975	$0.001203	$0.000555	$0.000488	$0.000310	$0.000221
1930.....	207,148,958,895	237,910,083	116,094,395	16,730,653	99,363,742	39,295,707	60,068,035	40,472,914	19,595,121	0.001150	0.000560	0.000479	0.000290	0.000195
1931.....	223,546,162,818	222,944,026	106,176,877	9,940,023	96,236,854	39,796,149	56,440,705	36,446,865	19,993,840	0.000998	0.000475	0.000430	0.000253	0.000163
1932.....	228,555,823,248	211,788,647	101,769,588	15,766,556	86,003,032	37,486,880	48,516,152	28,184,265	20,331,887	0.000926	0.000445	0.000376	0.000212	0.000123
1933.....	253,434,728,002	217,192,354	109,381,770	24,007,935	85,373,835	35,496,998	49,876,837	27,880,452	21,996,385	0.000855	0.000432	0.000336	0.000197	0.000110
1934.....	183,422,590,997	199,165,597	114,300,769	27,416,607	86,884,162	32,164,315	54,719,847	32,462,063	22,257,784	0.001085	0.000622	0.000473	0.000298	0.000177
1935.....	198,160,771,425	197,368,209	117,782,583	28,418,664	89,363,921	33,487,243	55,876,678	34,670,224	21,206,454	0.000995	0.000595	0.000450	0.000282	0.000175
1936*....	217,000,000,000	219,057,109	124,566,316	31,667,436	92,898,880	31,519,244	61,379,636	38,248,175	23,131,461	0.001008	0.000573	0.000428	0.000282	0.000176
1937.....	303,016,367,000	248,645,057	138,203,811	38,562,724	99,641,087	29,100,125	70,540,962	45,054,857	25,486,105	0.000821	0.000456	0.000328	0.000233	0.000149
1938.....	286,786,930,000	228,211,228	133,083,515	34,327,104	98,756,411	29,871,583	68,884,828	42,522,775	26,362,053	0.000795	0.000464	0.000344	0.000240	0.000148
1939.....	289,610,147,000	212,466,138	129,065,507	31,935,641	97,129,866	30,488,234	66,641,632	40,974,897	25,666,735	0.000735	0.000446	0.000335	0.000230	0.000142
1940.....	305,933,323,000	225,760,482	143,202,349	41,283,379	101,918,970	31,381,322	70,537,648	42,564,845	27,972,803	0.000738	0.000467	0.000333	0.000230	0.000139
1941.....	350,785,208,000	251,684,772	170,081,177	59,632,736	110,448,441	32,393,069	78,055,372	48,016,327	30,039,045	0.000716	0.000484	0.000315	0.000222	0.000137
1942.....	384,473,820,000	245,061,060	186,728,842	63,221,873	123,506,969	34,204,336	89,302,633	54,448,558	34,854,075	0.000637	0.000485	0.000321	0.000232	0.000142
1943.....	453,925,982,000	276,652,251	214,032,074	65,584,137	148,447,937	39,072,812	109,375,125	64,661,570	44,713,555	0.000609	0.000472	0.000327	0.000241	0.000143
1944.....	508,596,446,000	310,194,453	242,354,737	69,987,227	172,367,510	41,986,873	130,380,637	73,563,475	56,817,162	0.000609	0.000476	0.000339	0.000256	0.000145

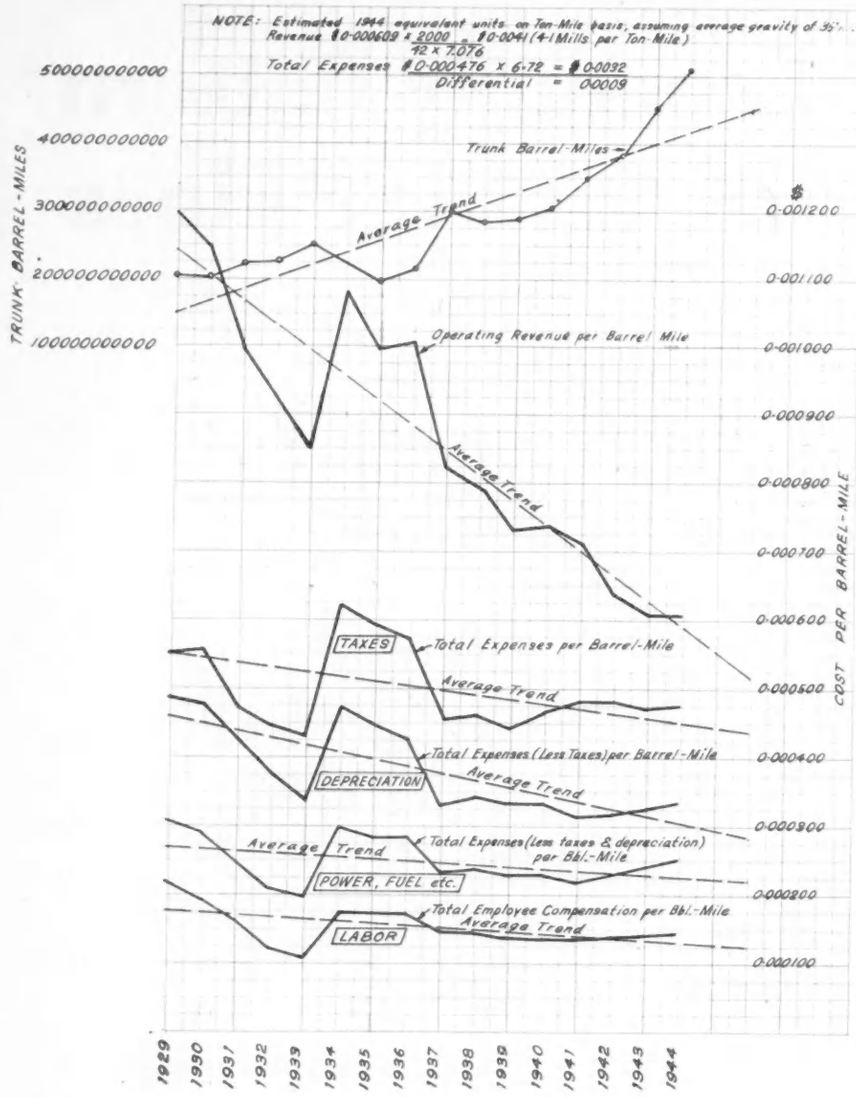


FIGURE 1

ominous black cloud known as the Consent Decree. This final judgment, entered December 23, 1941, in Civil Action 14060, in the District Court of the United States for the District of Columbia, by United States of America, Plaintiff, vs. The Atlantic Refining Company et al, Defendants, under the authority of the Elkins Act, enjoins a large number of important pipe lines from paying to shipper-owners, as earnings or dividends in any year after 1941, any more than 7 percent of the ICC valuation at the close of the next preceding year. Excess earnings over 7 percent, if reinvested in carrier property, are excluded from the valuation base in subsequent calculations so that the net effect is to force a choice of disbursing the 7 percent money, if earned, into either dividends or reinvestment in productive property. Since depreciation is, of course, included in the yearly determinations of value, the "slow but inexorable march to the junk heap" is forcing a steady but inevitable decline in the value base. This can only have a disastrous effect on pipe line finances and economics if carried through to ultimate exhaustion of value and it is to be hoped that some just solution of this valuation problem will be found before it becomes too acute. The alternative is obviously a degradation or deterioration in the service supplied by the shipper-owned oil pipe lines involved in the suit and these embrace most of the leading units in the industry.

So much for the major overall revenue—total cost relationships. A study of the minor cost trends, shown on Figure 1, is also worthwhile. Total expense was broken down into four main elements: (a) taxes, (b) depreciation, (c) power, fuel and miscellaneous, (d) labor, and the variation between individual trends is interesting.

TABLE 2

Oil Pipe Lines Reporting to Interstate Commerce Commission

YEAR	Number of Employees	Compensation	Average Compensation per Employee
1929	23,457	46,251,004	1,971
1930	21,948	40,472,914	1,844
1931	19,854	36,446,865	1,835
1932	16,291	28,184,265	1,729
1933	18,884	27,880,452	1,476
1934	20,853	32,462,063	1,556
1935	21,515	34,670,224	1,610
1936	23,235	38,248,175	1,644
1937	24,168	45,054,857	1,864
1938	21,770	42,522,775	1,955
1939	20,741	40,974,897	1,975
1940	21,573	42,564,845	1,973
1941	22,352	48,016,327	2,148
1942	23,156	54,448,558	2,351
1943	23,442	64,661,570	2,758
1944	23,497	73,563,475	3,131

Taxation Effect

The effect of increasingly heavy taxation in modern costs is strikingly shown by the tax share of total expense. In 1929 it was 11.98 cents of the cost dollar whereas in 1944 it was 29.30 cents. This increase of 144 percent in the tax zone can be seen to be the strongest factor in keeping total cost up. Postwar tax policy may alleviate this somewhat but probably not much.

The depreciation share in the total cost dollar has declined from 32.17 cents in 1929 to 17.32 cents in 1944. Most of this drop of 46 percent ocurred in 1937 as the result of ICC Order 19200, prescribing a depreciation policy for all pipe line carriers, followed by a sub-order for each individual carrier, specifying in detail its particular schedule of rates. We can logically expect the depreciation share to be rather steady in the future.

Power, fuel, etc., are seen to have been steady through the 16 years in question and this trend can be expected to continue. Their share should even decrease somewhat, due to the technological improvements noted previously.

The overall trend of labor during the 16 years is seen to be slightly downward, due to the sharply increased volume handled, but during the past eight years it has been quite steady. With the present tendency for all wages to rise, it seems likely that this trend will shortly start upward. This labor share is based on the reported total compensation to all employes. Table 2 summarizes the figures. The total number of employes in 1944 is practically the same as in 1929, yet corresponding total compensation increased from $46,251,004 to $73,563,475 with average compensation per employe increasing from $1971 to $3131 or by 59 percent.

Average straight line trends for all data shown on Figure 1 were computed by the least square method, the most accurate statistical method known for this purpose. It may be questioned whether or not for barrel-miles, the straight line is the best average, but for the other data, at least, it seems to give rational results.

Since the chart and tables reflect overall current operating results of practically an entire industry, with assets of about $1 billion, the averages would seem to furnish a valuable general guide, or criterion, against which any individual pipe line could compare its own results. It is hoped that more critical cost analysis will be stimulated on a broad scale, along these lines.

Summing up, it appears that the industry has entered a critical period, in regard to its unit cost differential between revenue and cost and that, to avoid a crisis in solvency, extraordinary efforts are needed to:

1. Increase tariff rates, if possible.

2. Reduce costs, by every conceivable method.

3. Remove the objectionable feature of the Consent Decree by which excess earnings over 7 percent of value are presently prevented from being "plowed back" into the value base.

Two-Way Radio

AFTER more than six months of operation, the two-way frequency modulation radio network of United Gas Pipeline Company is hailed by officials as a "great advancement in maintaining uninterrupted natural gas service and in meeting increased postwar demands for the fuel" throughout a 15,000-square-mile area in Texas and Louisiana.

By means of the network of transmitters and portable units in the Company's service trucks, uninterrupted communication is maintained under all sorts of weather conditions throughout a vast area of producing wells, pipe lines, compressor stations and distribution facilities.

The network consists of three fixed stations in the company's Carthage, Texas, gasoline plant, Sterlington, La., compressor station and in Shreveport, along with 44 portable-mobile units installed in service cars and trucks, providing coverage of all pipe line operations and major gas fields within a radius of 50 to 60 miles of fixed stations.

Repair crews are dispatched from one point to another in a fraction of the time formerly required when telephone lines only were used. In addition, meter and well attendants who control flow gas from wells to main pipe lines are in direct contact with dispatchers and are able to meet almost instantly constantly varying load conditions which arise during normal operations. Thus, with a radio telephone network to augment the telephone wire system, efficient and continuous gas flow in the company's pipe line system is assured.

When wire communications fail, main points may still be contacted. A great advantage of the radio telephone system is that contact may be made with isolated points where there is no other form of communication and where it is not considered practical to build wire lines.

It is anticipated that the new communications system will be of tremendous value in event of hurricanes, severe windstorms, torrential rains or other unusual weather conditions which might knock out telephone lines. The radio network under such conditions could be used to dispatch help to stricken areas when no other means of communication are available. Thus, the facilities, according to Company officials, have public service as well as utilitarian value to the Company and its customers.

The Shreveport and Sterlington fixed stations are equipped with a 250-watt fixed frequency transmitter operating on an assigned frequency of 31.18 megacycles. The Carthage installation differs only in its fixed frequency transmitter, which is 50 watts. Equipment also includes two receivers, one of which is for use in station-to-station transmission and operates at a frequency of 31.18 megacycles. The other is operated at a car-to-fixed station frequency of 31.02 megacycles. Operation is fully automatic and remotely controlled from a console installation in the dispatchers' office.

The antenna towers are each equipped with a coaxial line to the transmitter, with the antenna mounted at the top of the tower. At Shreveport and Carthage the overall height of the tower is 210 feet. At Sterlington the overall height is 315 feet. The difference in tower height was necessary due to the difference in altitude of the Sterlington and Shreveport tower locations.

Latest type aviation warning lights are installed, consisting of two 500-watt red lights on each tower at one-third and two-third levels, and a 1000-watt flashing beacon at the top controlled automatically by a photo-electric cell. In addition, each station is equipped with emergency power to fully insure continuous operation during storm periods and hazardous weather conditions when commercial power might fail.

The 44 portable mobile units, installed in service cars and trucks each consist of a 50-watt transmitter designed for a two frequency operation. One is for fixed station-to-car communication of 31.02 megacycles; the other for car-to-car communication of 31.18 megacycles.

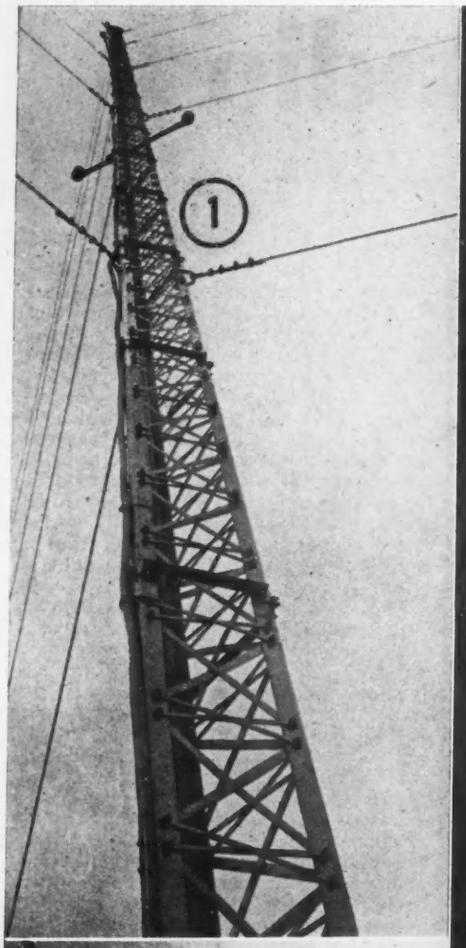
Mounted on the roof-top of each vehicle is a one-fourth wave antenna designed to withstand severe shocks incurred in rough pipe line operations. To insure continuous operation, each car is equipped with a heavy duty 180-ampere battery with a special generator and voltage regulator.

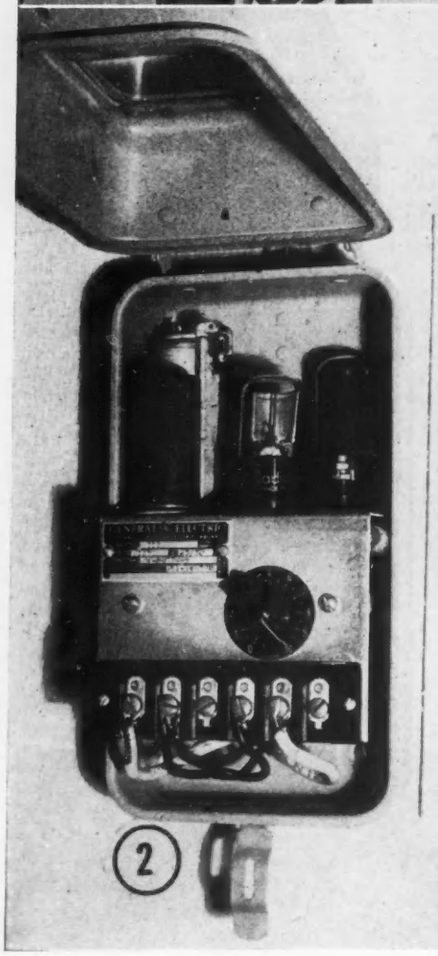
In operation, this radiotelephone network provides a continuous talk-back range from car-to-fixed-station of 50 miles; from fixed-station-to-fixed-station of approximately 100 miles.

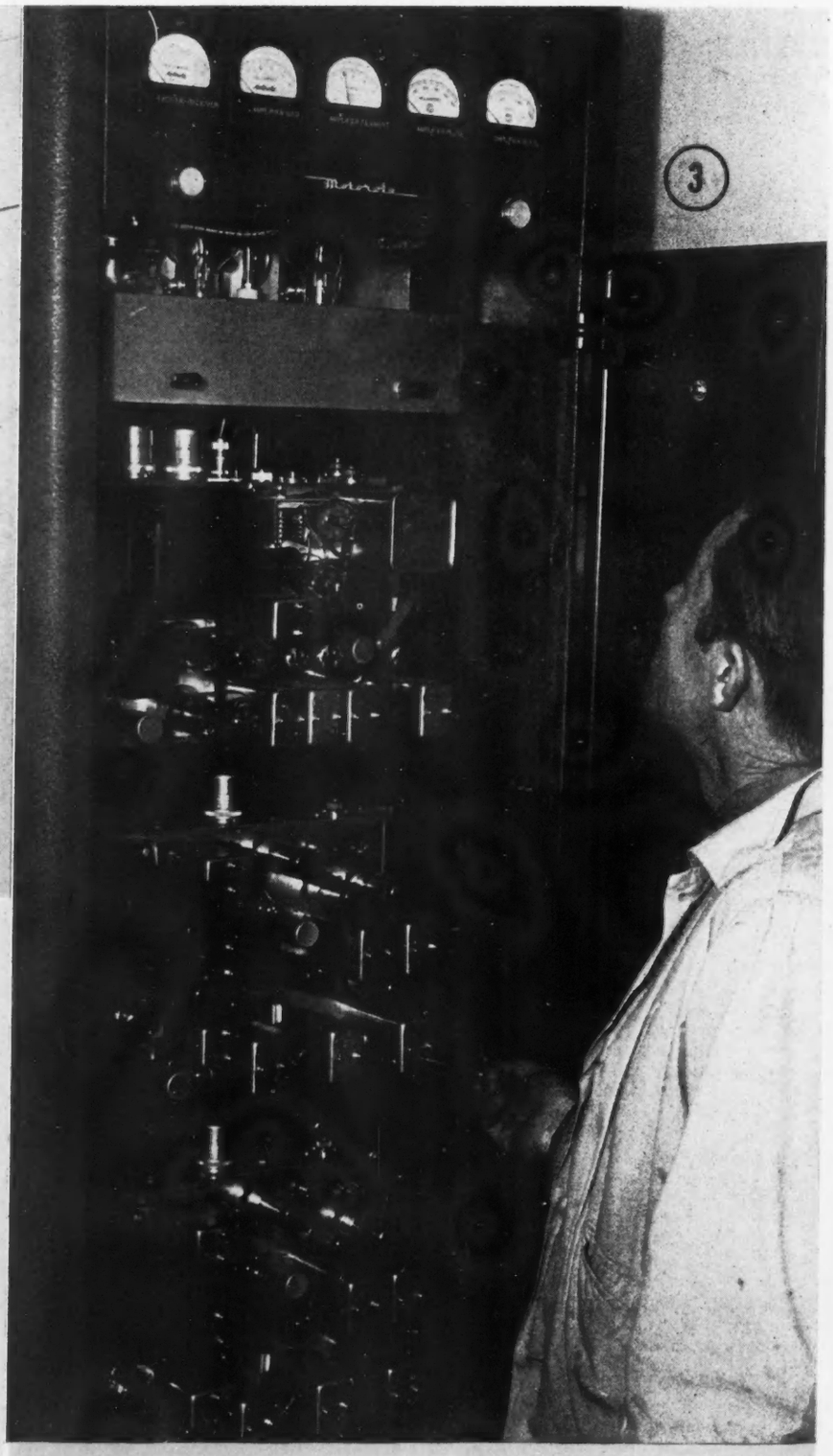
Approximately 7854 square miles are covered by each of the 250-watt power output fixed stations. The 50-watt station at Carthage covers a range of approximately 1963 square miles of territory.

(See photos and diagram on following pages)

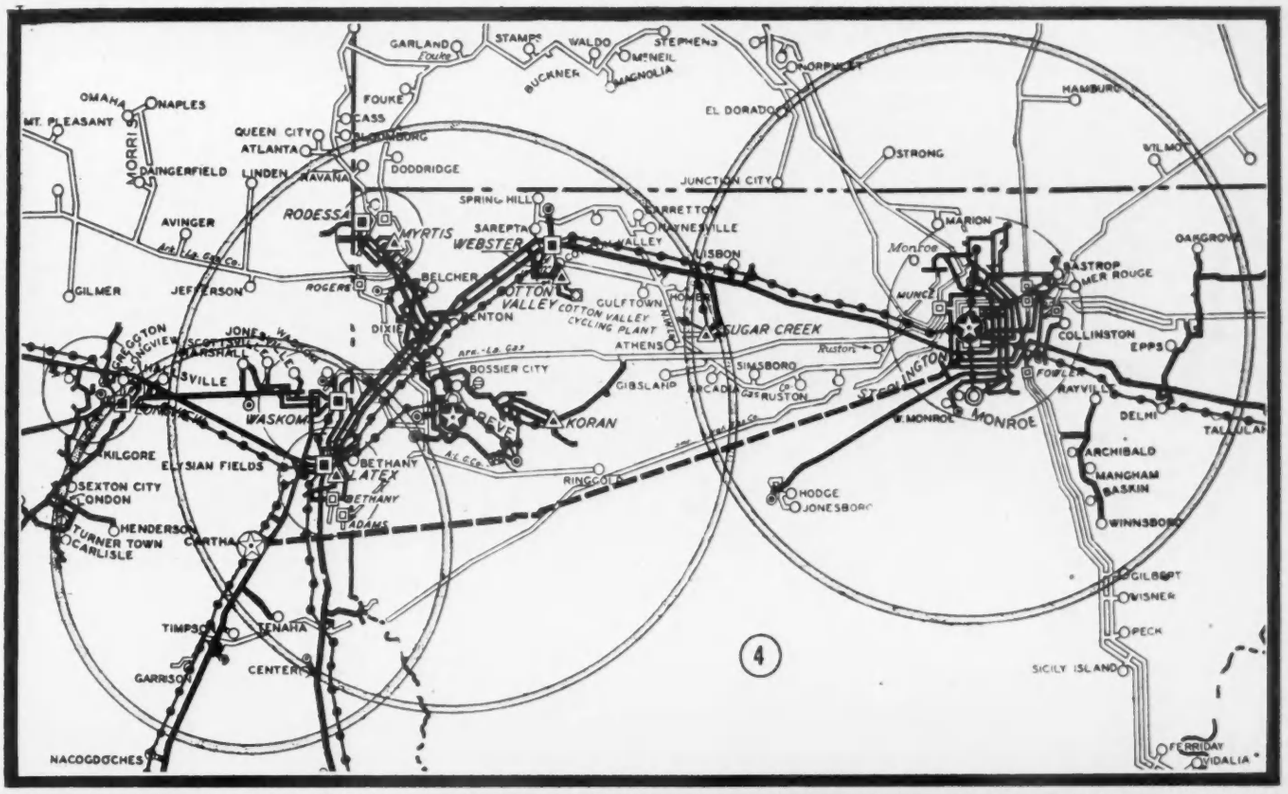
Antenna and instrument room of Station KUHC at Carthage. This is a 50-watt unit of the United Gas radiotelephone network which covers an area of 15,000 square miles.







1. Looking up at the Carthage radio tower.
2. Radio towers are equipped with flashing lights to prevent them from being a hazard to aerial navigation. The photo-electric eye picture here is the key mechanism in operating the warning signals.
3. D. F. Ball, assistant Telephone and Telegraph Department superintendent, makes an adjustment inside the transmitter cabinet at Cedar Grove, a unit in the United Gas Pipe Line radio-telephone network.

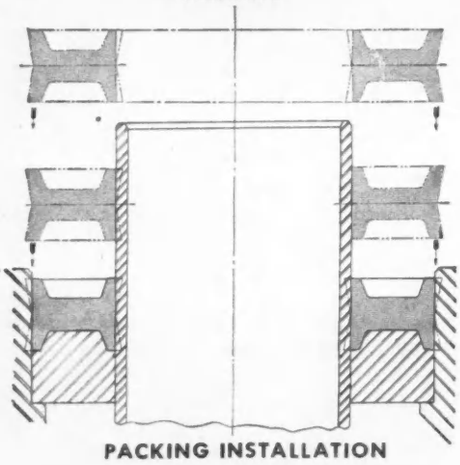


4. The map shows the range of the radiotelephone network covering approximately 15,000 square miles of territory in which the company operates in East Texas and North Louisiana. Overlapping ranges serve to link the three central stations.

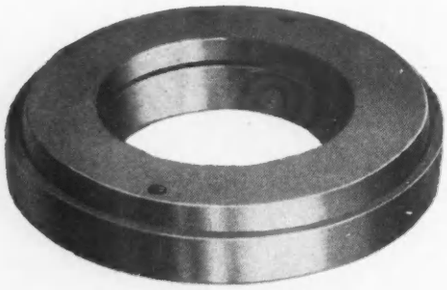
5. Transmitting and receiving equipment installed in United Gas service cars and trucks are compact units fitting into the dashboard.

6. Calvin J. Norris, truck driver, talks to Station KUHA, at Sterlington through the two-way radio installed in truck from a point on a United Gas pipe line near Ruston, La.

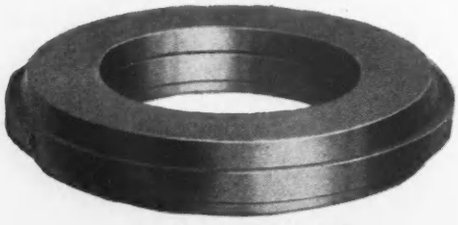
PACKING



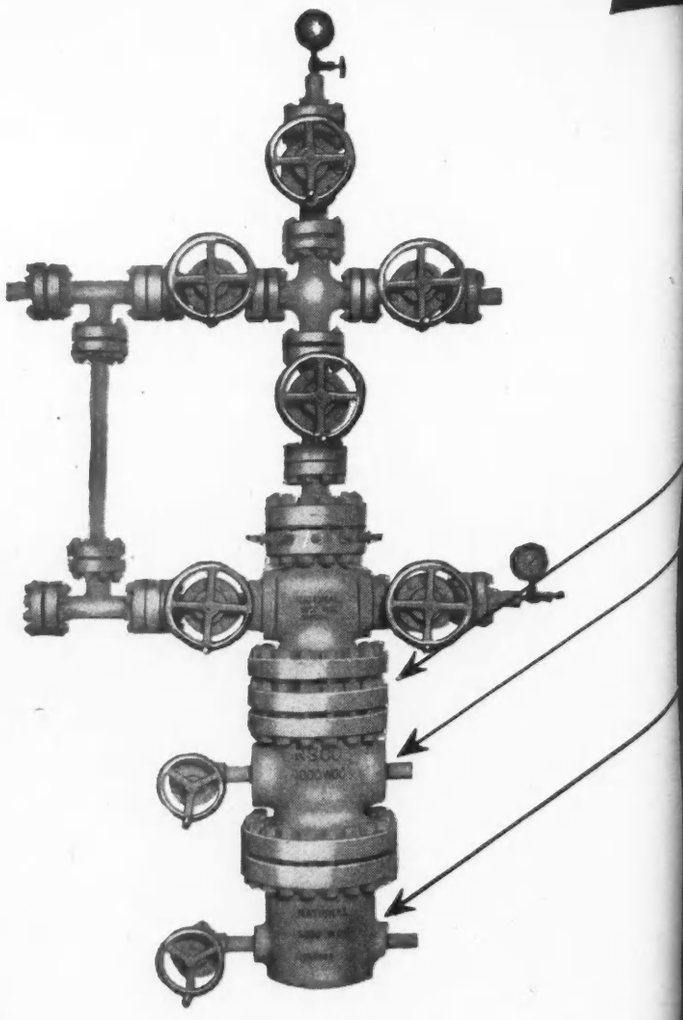
PACKING INSTALLATION



PACKING SUPPORT



PACKING SPACER



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Type "B" Packing is of double-lip construction which insures positive sealing regardless of whether a higher pressure exists in the lower annular space due to ineffective cementing and high pressure sands, or in the upper annular space.

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The packings are easily installed: Grease the packing to make it slip readily, use any flat piece to stretch the inner lips around the casing, and compress the outer lips into the body, push the packing down, and the job is finished.

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Pipe-Liners River

By ROBERT L. BUCK

Barges holding drill rigs are drilling holes preparatory to setting dynamite shots in river bed.

Barges loading holes with dynamite, preparing to setting off shots. Dynamite is placed in holes drilled by barges which have been over the river previously.

River crossing during process of cleaning up after dynamite shots were set off in river bed.

THE construction of Tennessee Gas & Transmission Company's 24-inch natural gas line which extended about 1300 miles from Corpus Christi, Texas, to West Virginia, presented some difficult engineering problems in connection with river crossings which included the Mississippi, Tennessee, Kentucky and Cumberland rivers.

At best, the job of laying a line across a river is fraught with varied problems but seldom does a construction engineer face "the book" on a single river crossing. This condition confronted Williams Brothers Corporation upon reaching the Cumberland River near Ashland City, Tenn. Here it was necessary to construct and devise in order to meet all major river crossings construction practices which confront the average pipe line construction engineer.

The Cumberland River is a navigable stream and its level is governed by a series of locks. Plans had to be made to cross the river with three 16-inch lines with a header on each side of the river that tied into the main 24-inch line. At the same time it was incumbent on the contractor to keep the river open to navigation. In order to do this the contractor had to meet specifications of the contract as well as those presented by the U. S. Engineers.

Another problem that had to be overcome was the blasting of the channel or trench across the river out of solid rock.

Barge Platforms

Bulldozers and draglines were brought in to prepare the right-of-way between the river edges and the header sites. As this work progressed large barges, 130 feet long and 20 feet wide, were floated into place to serve as platforms for three water-type drilling rigs which were to be used for drilling a total of 450 holes in the rock bottom which in turn were filled with dynamite. When the string of holes was drilled an expert from the powder company supervised the loading of the holes and the shooting. Three heavy shots were required to clear the Cumberland River channel, the first and largest consisting of a charge of 48,000 pounds of dynamite while the supplementary shots were of 32,000 and 24,000 pounds, each.

Care had to be exercised in the mounting of the drilling rigs which had to be spaced so as to coincide with the ditch lines of the river. This was achieved and

Lick Tough Crossing

Williams Brothers Corporation

by using one barge on each side of the river two holes could be drilled in each ditch line at the same time. Where blasting was not necessary as in the case of ditches near the river's edge the trench was dredged to the required depth of six feet by diesel-powered sand pumps mounted on steel barges that were constructed at the company's Houston and Chamblee, Ga., shops. Backhoes and draglines were used for ditching for header installation and between headers and the river edge.

When this phase of operations was completed, pipe for the crossing was conveyed to the site and welded in sections, each weld being reinforced with a sleeve, having first been tested with air pressure. The sections were then coated with bitumen and wrapped and the river clamps installed at proper intervals. In order to protect the pipe from scarring, wooden mats were placed around each section.

Clearing Debris

Following the dynamite shots engineers were confronted with the problem of clearing out the debris so that the pipe could be laid across the river. Draglines, dredges and clamshells working from barges proved too slow and in order to accelerate progress a dipper dredge with a 26-foot stick and a 1½-yard bucket was put to work. It was discovered, however, that the stick was just two feet short of reaching the required depth. At this point the U. S. Engineers stepped in and manipulated the river locks so as to lower the level of the river the required two feet in the vicinity of the crossing. This time-saving maneuver resulted in obtaining the necessary depth with the dipper dredge and the excess fill from the ditches in the channel was loaded on barges and moved away. This material was later used for refilling after the pipe lines were laid across the river.

With the ditches cleared of debris each of the three 16-inch lines was pulled across the river by two D-8 tractors equipped with heavy duty towing winches and placed in position. Following this operation the dipper dredge used for clearing the ditches was now employed to back-fill and the same was accomplished at both river banks by the bulldozers and draglines which initiated the crossing operation.

General view of the river crossing area, after cleanup work following shots was completed.

Starting to lay pipe line from river bank across the river

Installing final tie-in joint to the pipe line, which has already been laid in the river bed.

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Exploratory Drilling Slowed by Shortages

THE exploratory drilling program for the first five months of this year holds a slight edge over operations for the comparable period of last year, but is showing signs of slackening as material shortages, resulting from the steel strike, become evident.

These shortages, casing and drill pipe principally, are showing their effects not only on exploratory drilling, but drilling in general. The weekly rate of completing exploratory wells during May represents a considerable decrease from the weekly average during the preceding month, and the same is true for wells of all classes.

During May there were 371 exploratory tests completed, for a weekly average of 74.2 wells, while 90.3 wells were completed per week in the preceding month. For the first five months of this year exploratory completions total 1745, a 1.3 percent lead over the 1722 wells finished during the same five months of last year.

Success Same

Of the 371 exploratory wells completed during the month, 23.7 percent were completed as producers, which is almost the same degree of success encountered during the previous month. Of the total for the first five months, 21.9 percent were producers, while only 19.2 percent were successful during the same months of last year.

There were 44 new sources of oil discovered during May; these being 28 new

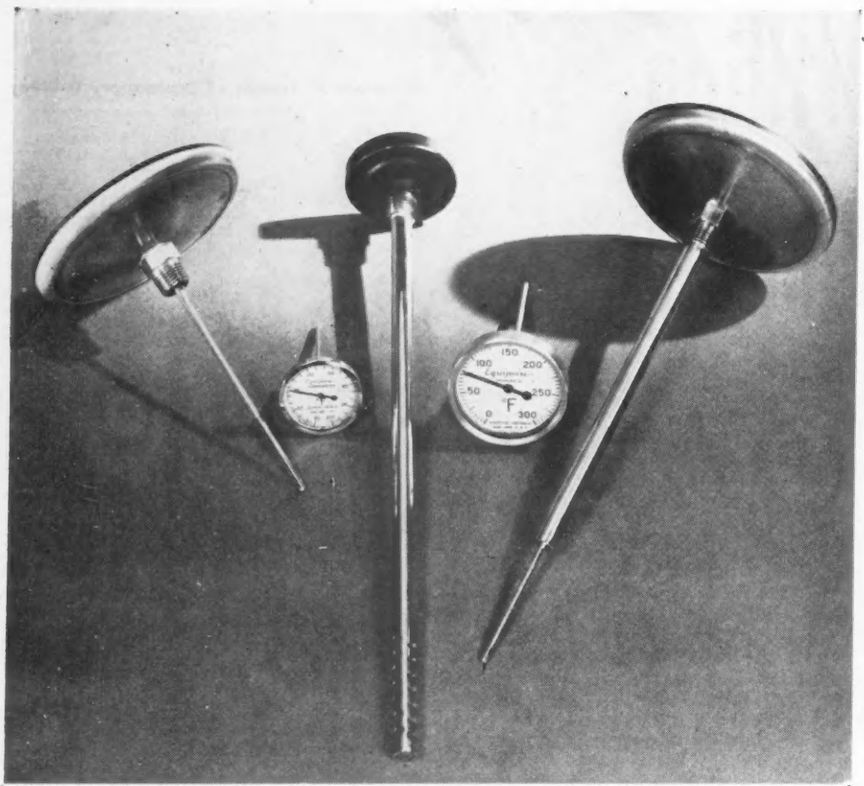
Summary of Results of Exploratory Drilling

ITEM	May, 1946	April, 1946	5 Months: JAN.-MAY 1946	1945	Percent Diff.
Oil Discoveries	44	43	202	190	+ 6.3
New Fields	28	15	118	134	— 11.9
New Pays	16	28	84	56	+ 50.0
Distillate Discoveries	11	11	33	21	+ 57.1
New Fields	6	5	16	15	+ 6.7
New Pays	5	6	17	6	+183.3
Gas Discoveries	9	12	57	43	+ 32.6
New Fields	8	7	43	37	+ 16.2
New Pays	1	5	14	6	+133.3
Total Discoveries	64	66	292	254	+ 15.0
Extensions to Fields	24	19	91	76	+ 19.7
Oil Fields	17	15	64	66	— 3.0
Distillate Fields	2	.....	4	2	+100.0
Gas Fields	5	4	23	8	+187.5
Total Prod. Tests	88	85	383	330	+ 16.1
Dry Holes	283	276	1,362	1,392	— 2.2
(Weekly Average)	56.6	69.0	61.9	63.3	— 2.2
Wildcats	277	273	1,328	1,350	— 1.6
New Pays	3	1	21	23	— 8.7
Outposts	3	2	13	19	— 31.6
Total Expl'tory Tests	371	361	1,745	1,722	+ 1.3
(Weekly Average)	74.2	90.3	79.3	78.3	+ 1.3
Percent Productive: (Weekly Average)	23.7	23.5	21.9	19.2	.....
Percent Dry: (Weekly Average)	76.3	76.5	78.1	80.8	.....

Dry hole completions are from weekly reports and totals represent completions for 5 weeks in May, 1946; 4 weeks in April, 1946; 22 weeks in Jan.-May, 1946; 22 weeks in Jan-May, 1945.

Results of Exploratory Drilling in May and First 5 Months, 1946-1945, by Districts

State or District	MONTH OF MAY, 1946													FIRST FIVE MONTHS, 1946																
	Productive Tests									Unproductive Tests			Total Exploratory Tests	Productive Tests									Unproductive Tests				Total Exploratory Tests	
	New Fields			New Pays			Extensions			Total Productive				New Fields			New Pays			Extensions			Total Productive							
	Oil	Gas	Dis.	Oil	Gas	Dis.	Oil	Gas	Dis.		Wildcats	New Pays	Outposts		Oil	Gas	Dis.	Oil	Gas	Dis.	Oil	Gas	Dis.	5 Mo. 1946	5 Mo. 1945	Wildcats	New Pays	Outposts	Total Dry 5 Mo. 1946	Total Dry 5 Mo. 1945	5 Mo. 1946	5 Mo. 1945
Alabama																							1	.5			5	5	5	6
Arizona																								1			1		1	
Arkansas	1								1	5			6	1						1			2	12		1	13	22	15	22
California							2	2	4	20			24	3	2		3			6	3		17	5	101			101	115	118	120
Colorado										1			1							3	1		3	1	6			6	2	9	3
Florida							1		1	1			2							1			1		7			7	8	8	8
Georgia										1			1												2			2	3	2	3
Illinois	1			4			1		6	27			33	5			7			14			26	40	162			162	120	188	160
Indiana	3	1		1			1		6	4			10	3	1		3			3			10	2	19			19	38	29	40
Iowa																													1		1
Kansas	5								5	18			23	19	3		2			13	1		38	41	94			94	129	132	170
Kentucky							2		2	6			8	2	2		3			2			9	6	35			35	36	44	42
Louisiana	2			3		1			6	15		1	22	12	1	3	15	2	6		2		41	29	75	1	1	77	59	118	88
North Louisiana	2								2	13			15	5	1	1		1	2		1		11	5	46	1		47	36	58	41
South Louisiana				3		1			4	2		1	7	7		2	15	1	4		1		30	24	29		1	30	23	60	47
Michigan	1	2	1				1	1	6	22			28	5	2	1		3		4	1		16	11	88		1	89	94	105	105
Mississippi										2			2	1	1						1		3	4	21			21	52	24	56
Missouri										2			2										5		5			5	6	5	6
Montana										3			3				1						1	4	6			6	4	7	8
Nebraska																													2		2
New Mexico				1					1	4	1		6				2			1			3	6	23	2		25	27	28	33
New York																									1			1		1	
Ohio		1					2		3	6			9	1	8						10		19	13	18			18	28	37	41
Oklahoma	6	3		2			4		15	16			31	27	9	1	4	5		5		1	52	44	106			106	123	158	167
Oregon	..									1			1												1			1		1	
Pennsylvania	..														2								2							2	
Tennessee																									2			2	1	2	1
Texas	9	1	4	5	1	4	5		2	31	122	2	2	157	37	9	10	43	3	11	10	4	3	130	118	527	18	10	555	507	685	625
E. Texas Border															2	3	1	1				1		8		2			2	7	10	7
Rest of E. Texas	1								1	8			9	2			1	1			1	1		6	4	40	2		42	31	48	35
North Texas	4						1		5	39			44	12				7			1			20	16	153	3		156	123	176	139
West Central Tex.	1								1	19			20	7	1			3						11	11	72	3	1	76	50	87	61
West Texas	1	1		2			3		7	14			21	4	3			10			4			21	23	60	5	4	69	104	90	127
Panhandle																										8	1		9	5	9	5
Upper Gulf Coast				3			4		1	8	11	1	20	3			3	14	2	6	3	1	2	34	31	53	1	2	56	52	90	83
Lower Gulf Coast	2			4					1	7	14		2	23	2		5	6		5		1	1	20	23	60	2	2	64	76	84	99
Southwest Texas					1		1			2	9			11		2		1	1		1			5	8	43		1	44	45	49	53
South Central											8	1		9	5									5	2	36	1		37	14	42	16
Utah															1									1		1			1		2	
Washington											1			1										1		1			1		1	
West Virginia																2								2		4			4		6	
Wyoming			1							1				1	1	1	1	1	1		1	1		7	5	5			5	10	12	15
Total U.S.	28	8	6	16	1	5	17	5	2	88	277	3	3	371	118	43	16	84	14	17	64	23	4	383	330	1328	21	13	1362	1392	1745	1722



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Odessa Tex.—Climax Industries
Tulsa, Okla.—Climax Industries
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fields and 16 new paying horizons in existing fields. So far this year there have been 202 new oil sources opened compared with 190 for last year's period, an increase of 6.3 percent. A breakdown of these discoveries shows 118 new fields against 134 for last year, and 84 new oil pays compared with 56 last year. These figures are indicative of the increased efforts being directed toward the proving of new and deeper reserves in established fields.

During the month there were six distillate fields and five pays discovered, making a total of 11 new sources of distillate. There have been 33 distillate discoveries so far this year against 21 for the like period of 1945. The number of new fields is practically the same as last year's figure, being 16 against 15, while new pay horizons outnumber the earlier figure, 17 to six.

Explorations for gas netted nine new sources during May, eight new fields and one new horizon. Comparative totals for the year and last year are total gas discoveries 57 against 43; new fields 43 against 37; new pays in existing fields 14 against six. The attempts to prove new reserves of gas in established fields is following the same upward trend as those in the cases of oil and distillate.

Extension Wells

Wells successfully extending the boundaries of existing fields total 91 for the first five months of this year, while only 76 were able to expand productive areas during the comparable period of last year. Of this total 64 extended oil fields against 66 for last year's period, four distillate against two, and 23 gas against eight last year.

The number of dry holes drilled in exploratory tests so far this year total 1362, while 1392 were drilled in the same time of the preceding year. Strict wildcats accounted for 1328 of this unsuccessful total against 1350 last year. Unsuccessful attempts to locate new pay horizons accounted for 21, while 23 of the same class were dry last year. Thirteen wells attempting to extend field production, at least ½ mile from nearest production, failed to find the pay, while 19 such wells were recorded during the first five months of 1945.

(See tables on following three pages.)

Cost Accountants Install

George F. Winters of Barrow, Wade, Guthrie and Company, recently was installed as president of the Tulsa Chapter, National Association of Cost Accountants. Other officers installed include J. J. McLeod, Hinderliter Tool Company, and Herschel S. Medlin, Moorlane Company, vice presidents; Louis Thomas Wall, First National Bank and Trust Company, treasurer; Charles E. Sims, Peters Petroleum Corporation, secretary. Directors serving as committee chairmen are: Carl J. Senger, Warren Petroleum Corporation; Carl J. Nash, Nelson Electric Company; L. C. Peterschmidt, Engineering Laboratories, Inc.; Edward D. Loughney, Gulf Oil Corporation; Joseph Pravnan, United Autographic Register Company; O. R. Buttram, National Bank of Tulsa; M. M. Hargrove, University of Tulsa; Claude Williford and Laggus C. Island, Cost Accountants.

New Oil and Gas Fields and New Pay Horizons Discovered in the United States in May, 1946

Also Important Extensions to Established Fields

COUNTY	FIELD	COMPANY, WELL AND LOCATION	Date Spudded	Date Completed	Total Depth (Feet)	Completion Horizon (Feet)	[1]Name, Character and Age of Producing Formation	[2]Initial Production Method and Choke	Gravity of Oil	[3]Structure: [4]Method of Discovery	Tentative Evaluation of Discovery or Extension (Opinion of Relative Importance of Area from General Viewpoint of the Industry Based on Pertinent but Necessarily Incomplete Data; Later Development or More Complete Data Obviously Might Require Revision of this Tentative Opinion).
		ARKANSAS—New Oil Field									
Nevada		Chas. F. Steele et al's H. L. Waters 1, n½ nw ne 20-14s-21w, 2½ mi sw Irma fild.	3-21-46	5- 9-46	2263	1189- 1209	Nacatoch sd; U Cre	P 30; 80 wtr	....	.....	.....
		CALIFORNIA—New Oil Pay									
Santa Barbara	Casmalia	Bell-Casmite Oil Co.'s Arellanes 2, sect. 13-9n-35w	.....	4- -46	5950	4100- 4800	Sd; L Mio	P 320; 7% wtr	19.9	.....	Fld has been producer of 10-12 gravity oil.
		CALIFORNIA—Oil Field Extensions									
Kern	Mtn View	Texas Co.'s Richfield-Mott 1, 9-31s-29e, 1 mi s ext	.....	5- -46	6650	6080- 6135	Chanac-Sta. Marg. sd; U Mio	F 325; ¼"	32.8	.....	.....
Kern	Paloma	Western Gulf Oil Co.'s Los Angeles Athletic Club 76-1, 1-32s-26e ½ mi e ext	.....	5- -46	11465	11265-11465	Stevens sd; Mio	F 2000; 12/64"	31.7	.....	Adds about 120 acres to field.
Kern	Temblor	Richfield Oil Corp.'s Miller & Lux Fee 2, 18-29s-21e, 1 mi nw ext	.....	5- -46	2787	2725- 2746	Cranceros sd; Mio		....	.....	.....
Ventura	Del Valle	Universal Consolidated Oil Co.'s Aguirre 1, 13-14n-18w	.....	4- -46	3859	2988- 3859	.....	P 210; 6% wtr	21.6	.....	.....
		CALIFORNIA—Gas Field Extensions									
Solano	Kirby Hills	Standard of Calif.'s Kirby Comm. 1, 24-4n-1w	.....	5- -46	2350	1530- 1681	Domengine sd; Eoc	4.2 mln; ½"	....	.....	.....
Yolo	Dunnigan Hills	Natural Gas Corp.'s DuBois 1, 28-11n-1w, 1 mi sw ext	.....	5- -46	2880	2520- 2599	Capay sd; Eoc	2.7 mln; ½"	....	.....	.....
		FLORIDA—Oil Field Extension									
Collier	Sunniland	Humble's Gulf Coast Realty Co. 6, sw ne 19-48s-30e, 1 mi w ext	.....	5- -46	11578	11558-11578	Young (Glen Rose) dolo; L Cre	F 225; 5/32"	25.6	.....	.....
		ILLINOIS—New Oil Field									
Clinton	Sandoval, W.	Paul Doran's Thomas 1, nw ne ne 13-2n-1w, 1¼ mi sw of Sandoval pl	4-22-46	5-14-46	1423	1415- 1423	Cypress sd; U Miss	P 22; 96 wtr	....	.....	.....
		ILLINOIS—New Oil Pays									
Clay	Hoosier	N. V. Duncan's Nannie Gibson 1, nw nw se 2-4n-7e	4-25-46	5-28-46	2984	2892- 2902	Rosiclare li; L Miss	P 264	....	.....	Deepest and best well in pl; 3rd producing well in pool.
Franklin	Benton	Shell's Doty 1, 334 ft. nl., 977 ft wl nw ne 25-6s-2e (OWDD)	.....	5-21-46	2162	.....	Degonia sd; U Miss	P 72; 146 wtr	....	.....	Originally comp 5 yrs ago in Tar Springs sd. Shallow pay in a Tar Springs pool.
Jefferson	Markham City, W.	W. C. E. Brehm et al's Modglin 1, sw nw se 34-2s-4e	3-12-46	5-14-46	3092	3061- 3065	McClosky li; L Miss	P 12; 50 wtr	....	.....	.....
White	Storms	Sinclair-Prairie and Ohio's Riecken 2, nw nw se 1-6s-9e	4-14-46	5-21-46	3030	2323- 2334	Waltersburg sd; U Miss	.....	....	.....	.....
						3015- 3030	Aux Vases (New Pay) sd	P 220; 10 wtr	....	.....	Edge well of pl. 5th and deepest pay in pool.
		ILLINOIS—Oil Field Extension									
Wayne	Johnsonville, W.	Deep Rock Oil Co.'s U. S. Spicer 1, sw sw ne 25-1n-5e, ¾ mi s ext	3-30-46	5- 7-46	3086	3072- 3075	McClosky li; L Miss	P 12	....	.....	¾ mi s of disc well and 1¾ mi s of the only other well now producing in pool.
		INDIANA—New Oil Fields									
Gibson	.....	Illinois-Mid-Continent Oil Co.'s Parkinson 1, sw ne nw, 24-1s-12w	.....	5- -46	2090	2080- 2090	Benoist sd; Miss	P 90	....	.....	.....
Pike	.....	W. L. Lichlyter et al's Gerald Wirey 1, sect 9, 1s-9w, Clay twp	2-25-46	4- 7-46	1396	1388- 1396	Cypress sd; U Miss	P 10	....	.....	.....
Posey	Springfield	H. E. Ledbetter et al's N. Utley 1, se nw sw 30-5s-13w	.....	5- -46	3011	3006- 3011	McClosky li; L Miss	P 18	....	.....	.....
		INDIANA—New Oil Pay									
Posey	New Harmony, S.	Delta Drlg. Co.'s Elliott 12-A, 23-5s-14w	.....	5- -46	1365	1318- 1365	Pennsylvania sd; Penn	P 200	....	.....	Addition of the Penn. sd as a producing horiz in an already expanding fld boosts ultimate recovery. Disc. gd.
		INDIANA—Oil Field Extension									
Pike	Union-Bowman	W. L. Lichlyter's Conley 1, c e ½ sw nw 3-1s-9w, 1 mi w ext	.....	5- -46	1058	1055- 1058	Waltersburg sd; U Miss	P 120	....	.....	.....
		INDIANA—New Gas Field									
Fayette	.....	J. Harvey Snider et al's Asher Sizemore 1, sect 15, 13n-11e Orange twp	2-28-46	4- -46	1084	1074- 1084	Trenton li; Ord	.02 mln	....	.....	.....
		KANSAS—New Oil Fields									
Rooks	.....	Darby & Bothwel Inc.'s Husted 1-B, ne se sw 11-10s-19w, abt 4 mi w of Vohs pl.	.....	5-21-46	3588	3352- 3359	Lansing li; Penn	P 910	....	Flt; seis-sub	Good porosity, permeability reported; good recovery expected.
Rooks	Alcoma	Republic Nat. Gas Co.'s Cooper 1, se se se 14-7s-20w, abt 6 mi nw of Webster	.....	5-10-46	3539	3499- 3509	Arbuckle li; Cam	P 45; 10 wtr	....	Str trp; dr	Unimportant.
Saline	.....	L. Walker's Hagge 1, nw sw se 32-14s-2w, abt 2 mi se of Saline pl	.....	5-24-46	3252	3246- 3252	Viola li; Ord	P 91	....	Ant; sub	Porosity medium; recy expected average; extent of ar undetmned; not consid very impt.
Stafford	.....	Cities Service Oil Co.'s Kipp 1, ne ne ne 23-25s-14w, abt 3 mi nw of McAndless pl.	.....	5-21-46	4303	3844- 3863	Viola li; Ord	P 260	39.5	Ant; seis	Good strike; porosity fair; struct may cover 360 acres.
Stafford	.....	H. A. Hershfield et al's Shirk 1, se se ne 35-24s-14w, abt 2 mi s of Richmond pl.	.....	5-15-46	4274	3775- 3798	Viola li; Ord	P 120	....	Str trp; dr	Undetermined but possibly small.
		KENTUCKY—Oil Field Extensions									
Clinton	Highway	L. L. Morris' Clay Witham 1, ½ mi n ext	.....	5- -46	1160	1140- 1155	Trenton li; Ord	F 2500	....	.....	.....
Henderson	Smith-Mills	Sinclair Oil Co.'s Humphrey 1, 5-P-21, ½ mi s ext	.....	5- -46	2565	2550- 2565	McClosky li; L Miss	F 1050	....	.....	.....
		NORTH LOUISIANA—New Oil Fields									
Caddo	.....	Union Prod. Co.'s Noel Est. 1-A, 11-19n-16w	10- 2-45	5- 6-46	9225	5437- 5448	Pettit sd; L Cre	F 8; 6 wtr	39.5	.....	Produced on Gas Lift.
Red River	.....	M. T. Halbouty's Willie Savill 1, 36-11n-10w, on s flk of Bull Bayou ar	4-25-46	5-19-46	1277	1207- 1228	Nacatoch sd; U Cret	F 35; 1/8"	45	.....	.....
		SOUTH LOUISIANA—New Oil Pays									
Plaquemines	Bayou La Fleur	Calif. Co.'s E. P. Brady et al 2, 34-16s-24e, ne offset to disc well	3-15-46	5-13-46	10501	10445-10495	Miocene sd; Mio	F 260; 8/64"	36.9	SD; Refl seis	This is confirmation oiler for this field.
Plaquemines	Venice	Tide Water's Buras Levee Dist 29, 330 n&w of sec 21-21s-30e	1- -146	4-24-46	13020	13000-13020	Miocene sd; Mio	F 326; 4/64"	38.8	SD; rfl seis	.....
St. Landry	Port Barre	Pan American Prod. Co.'s H. L. Garland 17, 4-6s-5e	3-10-46	5- 8-46	9299	9169- 9191	Miocene sd; Mio	F 381; 12/64"	37.4	SD	Opens important new oil zone.
		SOUTH LOUISIANA—New Distillate Pay									
Acadia	Egan	Sun-Sohio's E. M. Regan 3, 31-9s-1w	2- 4-46	5- 1-46	13500	11874-11906	Vicksburg sd; Olig	F 390; 50% wtr; 3/32"	52	SD; refl seis	Probably not important because of lge amount of water.

New Oil and Gas Fields and New Pay Horizons Discovered in the United States in May, 1946

Also Important Extensions to Established Fields

COUNTY	FIELD	COMPANY, WELL AND LOCATION	Date Spudded	Date Completed	Total Depth (Feet)	Completion Horizon (Feet)	[1]Name, Character and Age of Producing Formation	[2]Initial Production Method and Choke	Gravity of Oil	[3]Structure: [4]Method of Discovery	Tentative Evaluation of Discovery or Extension (Opinion of Relative Importance of Area from General Viewpoint of the Industry Based on Pertinent but Necessarily Incomplete Data; Later Development or More Complete Data Obviously Might Require Revision of this Tentative Opinion).
		MICHIGAN—New Oil Field									
Oscoda	Mio	Ohio Oil Co. and Sohio Pet. Co.'s Mio Unit 1, se nw sw 30-25n-3e, 6 mi ne Rose City fld.	11-15-45	5-16-46	5129	4170- 4255	Richfield li & dolo; Devo	F & SW 26	....	Ant; geol-cd	Lge struct indicated but this zn hasn't proven very satisfactory to date in other areas.
		MICHIGAN—Oil Field Extension									
Mecosta	Wheatland	Rex O. & G. Co.'s Skalitzky 1, nw nw se 8-14n-7w, 1 mi se of abnd disc in ar.	3-13-46	5-16-46	3702	3701- 3702	Dundee dolo; Devo	F 1600; 1/8"	43	Ant; geol	Gives ar 1st rate importance; 1200 to 1600 acs estimated potential prod; could be 5,000,000 barrel reserve.
		MICHIGAN—New Distillate Field									
Clare	Garfield	Pure Oil Co.'s Freer 1, n½ nw sw 18-17n-6w, 6 mi ne Forl fld.	9-18-45	5-27-46	5037	5038- 5064	Richfield sd; Devo	F 100; 26.8 mln	52	Ant; geol	Well prodcd 100 bbls dist at gas prodtn rate of 1 mln ft/day. Import disc; first basin well to show thick sd sect in Richfield. Sd sect not pres in dp tests drld 6 to 15 mi from well.
		MICHIGAN—New Gas Fields									
Isabella	Rolland	West Michigan Consumers Co.'s Lake 1, se nw ne 30-13n-6w, 3 mi e Six Lakes gas fld.	5- 1-46	5-25-46	1336	1335- 1336	Michigan Stray sd; Miss	F 2.5 mln	....		
Mecosta	Green	Ashby Drlg. Co.'s Battle 1, ne sw se 18-16n-10w, 5 mi nw Big Rapids gas fld.	4-18-46	5- 5-46	1245	1240- 1245	Michigan Stray sd; Miss	F 1.6 mln	....	Ant; geol	Small pool.
		MICHIGAN—Gas Field Extension									
Ogemaw	Logan	Sun Oil Co.'s Adams-Walker 1, c nw 12-22n-3e.		5- -46	1464	1424- 1430	Berea sd; Miss	F .5 mln	....		
		NEW MEXICO—New Oil Pay									
Lea	Cass	Continental Oil Co. et al's J. M. Skaggs 4-B-23, c sw se 23-20s-37e, se offset to 7700-ft production.	11-28-45	5-20-46	7900	6760- 6830	Clear Fork (Yeso) li; Perm	F 111; 1"	37	Ant; geol	Failed in the dpr Penn pay. Produced on gas lift. Situated 9 mi nw of nearest prod in equiv zn.
		OHIO—New Gas Field									
Lorain		Ohio Fuel's Phillip Bobel 1, Lot 36, Penfield twp.		5- -46	2522	2512- 2521	Clinton sd; Sil	F 1.7 mln	....		
		OHIO—Gas Field Extensions									
Lorain	Wellington, N.	Ohio Fuel Gas Co.'s H. T. Breyley 1, Lot 158, Pittsfield twp.		5- -46	2247	2227- 2241	Clinton sd; Sil	F 3.7 mln	....		
Perry	Sayre	B. G. Davis' Ray Penrod 1, Sect 22, Bearfield twp, 1 mi sw ext.		5- -46	3896	3805- 3837 3890- 3896	Clinton sd; Sil Medina sd; Sil	F 0.43 mln	....		
		OKLAHOMA—New Oil Fields									
Cotton		Bridwell Oil Co.'s Houghton 1, se nw nw 23-3s-11w, abt 4 mi w of Temple.		5-27-46	1498	1490- 1498	Pontotoc sd; Perm	P 50	39	Ant; sub	No information.
Kingfisher		J. A. King et al's Lankhard 1, ne ne se 34-17n-6w, abt 6 mi ne of Kingfisher.		5-30-46	7717	7552- 7575	Hunton li; Sil	F 100	....	Str trp; dr	Undetmnd; looks like moderate strk; productivity depends on porosity which is fairly gd.
Lincoln		Deep Fork Drlg Co. et al's Hopkins et al 1, nw ne sw 8-14n-6e, abt 3 mi e of Davenport pl.		5- 6-46	3234	3206- 3226	Prud sd; Penn	P 20	36	Flt; dr	Unimportant.
McClain		Carter Oil Co.'s Thompson 1, cse ne 36-8n-4w, 1¾ mi n of Cole.		5-29-46	10592	9970-10035	Hunton li; Sil	F 2500; 1"	41.5	Str trp; seis	Marks opening of another import dp pl along se flk of the Anadarko Basin.
Pottawatomie		J. F. Smith et al's Klingensmith 1, sw sw se 23-8n-2e, aot 3½ mi w of Macomb		5-25-46	5640	5637- 5640	Wilcox sd; Ord	F 103	....	Ant; seis-sub	Gd porosity found in Wilcox with excellent recovery indicated; little gas press; gd oil shows in Hunton li.
Rogers		C. P. Quinlan's Martin 1, se se se 25-19n-16e 4½ mi sw of Inola.		5-29-46	445	423- 445	Bartlesville sd; Penn	F 40; 3 mln	35	Str trp; dr	Undetmned; may prove small but productive.
		OKLAHOMA—New Oil Pays									
Marshall	Aylesworth	Magnolia's South 2, ne ne sw 19-6s-7e.		5- 9-46	667	665- 667	Trinity sd; Cre	P 35	27.5	Ant; dr	Pl has 24 producers with incrsd activity expectd to result frm strk; Trinity sd expected to pay off over entire structure.
Payne	Ramsey	Mid-Continent Pet Co.'s Ramsey 4, sw se nw 18-18n-2e.		5-21-46	4802	4794- 4802	2nd Wilcox sd; Ord	F 854	41.7	Ant; dr	Import; may double orig reserves in pool.
		OKLAHOMA—Oil Field Extensions									
Creek	Tuskegee	W. M. Dunn's Walker 1, nw nw sw 30-14n-10e.		5- 9-46	2954	2945- 2954	Dutcher sd; Penn	P 25	38	Ant; seis-dr	Drilled on 600 ac block; probable 200 prod. acs.
Hughes	Spaudling, S. E.	Aylward Production Co.'s Lytal 1, se ne sw 16-6n-8e, 1 mi nw ext.		5- 2-46	2695	2610- 2630	Booch sd; Penn	P 35	39	Ant; dr	Ext proves abt 600 addit acs; abt 5000 bbls/ac recovery expected.
Oklahoma	Coon Creek	A. R. Jordan et al's Delaney 1, se ne sw 3-14n-1w, ¾ mi s ext.		5-24-46	5991	5922- 5991	Wilcox sd; Ord	F 780	39.5	Ant; seis-sub	Import strk; Wilcox recvy estimated at abt 10,000 bbls./ac.
Seminole	Twin Lakes	Bowman Drlg. Co.'s Caster 1, ne ne nw 21-9n-7e, ¾ mi nw ext.		5-18-46	3439	3420- 3439	Cromwell sd; Penn	F 337	39	Ant; sub	Good strk; porosity, permeablty gd; extent of structure undetermined.
		OKLAHOMA—New Gas Fields									
Beckham		Stephens Pet Co.'s Pennington 1, nw nw nw 27-8n-25w, abt 2 mi s of Erick.		5-27-46	2407	1940- 1967	Granite Wash cogl; Penn	F 1 mln	....	Flt; sub	Not important.
Lincoln		Kemp & Jackson's Wagner 1, ne ne ne 33-17n-6e, 2½ mi sw of W Shamrock dist.		5-23-46	3042	3015- 3042	Bartlesville sd; Penn	F 5 mln	....	Ant; seis	Indicates fairly import new gas ar likely to cover about a section.
Okfuskee		Wilcox Oil Co.'s Lewis 1, se ne ne 24-12n-9e, abt 6 mi n of Okemah.		5-17-46	3936	3180- 3196	Cromwell sd; Penn	F 2.5 mln	....	D; seis	Undetmnd; porosity governs recvy; struct may cover about 400 acres.
		EAST TEXAS—New Oil Field									
Smith	Mount Sylvan	Humble O & R Co.'s T. J. Pool 1, 660 ft from M/W/N/ and 660 ft from M/E/E lines of 243-ac tract, or 660 ft snl and 930 ft ewl of Wm. Saunders sur. 7.4 mi se of Van fld.	9-29-45	5- 4-46	7668	7339- 7352	Paluxy sdy-li; L Cre	F 522; ¼"	34.6	Flt ant; geop-geol	Cored pay last Dec.; comp delayed to cure title to extensive lse blk. Rated an import disc, with struct extndng into Van Zandt Co. Competitive drlg inevitable due to independents holding numerous small lses. Prod defined 5900 ft to se by field's 2nd test.
		NORTH TEXAS—New Oil Fields									
Archer		L. R. Dawson Jr. and Barnes' C. L. Abercrombie 1, 2100 ft nsl and 2500 ft wel of Blk 152, J. W. Harris subdiv.	4-20-46	4-26-46	1069	1060- 1066	Cisco sd; Penn	P 20; 10 wtr	38	Ant; geol	Small productive area due to nearby failures.
Archer		Smiley-Norwood Drlg. Co.'s A. L. Harris 1, 1050 ft nsl and 150 ft ewl of blk 71, J. W. Harris subdiv, 3500 ft w of prod and separated by failures.	4-26-46	5- 4-46	1135	1122- 1126	Cisco sd; Penn	P 45	38	Ant; geol	Small productive area due to nearby failures.
Young		Henry Craig et al's H. Hennig 3, 450 ft wel and 208 ft nsl of nw ¼ sec. 65, TE&L Co. sur. 1¼ mi sw of nearest prod.	5-14-46	5-18-46	1069	1066- 1069	Gunsight sd; Penn	P 8	38	Ant; geol	Nearby failures will restrict area.
Young		Timberlake and H. M. Kelleher's W. J. Bryant Base Hamilton 1, 2970 fe									

Young		Henry Craig et al's H. Hennig 3, 450 ft wel and 208 ft nsl of nw ¼ sec. 65, TE&L Co. sur. 1¼ mi sw of nearest prod.	5-14-46	5-18-46	1069	1066- 1069	Gunsight sd; Penn	P 8	38	Ant; geol	
Young		Timberlake and H. M. Kelleher's W. J. Bryant-Rose-Hamilton 1, 3370 ft s and 508 ft e of nwc TE&L sec 1369, but in TE&L fractional sec 3401, 1 mi s by w of production.	4- 1-46	5- 1-46	954	948- 952	Cisco sd; Penn	P 15	....	Ant; geol	Not important.
		NORTH TEXAS—Oil Field Extension									
Archer	Burns-Benson	Homer W. Snowden et al's J. E. Morrison 1, 1700 ft snl and 1900 fr ewl sec 1823, TE&L Co sur, 1 mi ne ext.	12-30-45	5- 5-46	5236	4495- 4530	Bend li; Penn	F 206; ¼"	41.5	Ant; geol	High structrly and 1st indication fld may attain importance.
		WEST CENTRAL TEXAS—New Oil Field									
Taylor		West Central Drlg Co et al's C. H. Murphree 1, se se se S.P. Ry Co 1, blk 9, 13⅜ mi w by s of Ingram fld.	4-20-46	5-18-46	3062	2622- 2629	L Cook li; Penn	P 124	42	Reef; geol	Small productive area.
		WEST TEXAS—New Oil Field									
Kent	Polar	Humble O & R Co.'s Lida Vick 1, c nw ne H&GN Ry. 45, blk 5, 6¾ mi e by s of Justiceburg 2500-ft pl; 105 mi w by n of nearest Ellen prod.	12-25-45	5- 1-46	7938	7775- 7810	Ellenburger dolo; Ord	F 214; .06 mln ¼"	38.6	Ant; geop	1st Ellen prod on e side of Perm Basin; putting in motion lge-scale lse and royalty play that will be followed by expanded explorations. Extent of prodtv ar is highly speculative.
		WEST TEXAS—New Oil Pays									
Andrews	S. Fullerton-Devonian	Superior Oil Co. (Cal's) Eva Coopwood 1, c ne ne psl 4, block A-47, 1 mi s of Devo prod.	3- 7-46	5- 9-46	7003	6885- 7003	Clear Fork li; Perm	F 691; ½"	42.1	Ant; geol	Comparative oil fl at same level passed by 4 Devo prodcrs, centering 2½ mi to nw and on same contour. This Clear Fork zn embraces major swt crude prodcng ar, involving structrl conditions similar to expansive Fullerton fld, but separated from same.
Gaines	Doss	Humble O & R Co.'s M. S. Doss 1, c sw sw psl 1, blk A-24, ¾ mi n by w of 7100-ft Clear Fork pumper.	12-12-45	4-16-46	7181	6040- 6475	Clear Fork (Tubb) li; Perm	P 187; 20% wtr	29.2	Ant; geol	Failed in regular Clear Fork pay. Yld from new zn not profitable considering depth.
		WEST TEXAS—Oil Field Extensions									
Andrews	Martin-Ellenburger	Atlantic Ref Co.-Phillips Pet Co.'s University 1-A-11, 1845 ft snl and 2033 ft wel of ne ¼ sec 1, blk 11, 1⅞ mi se ext.	12- 2-45	4-23-46	9060	8680- 8860	Ellenburger dolo; Ord	F 528; 3/16"	43.4	Ant; geol	Ellen correlates 144 ft high to nearest prodcr from this zn, thus opening consid acrge for develop, trending nw-se with sharp dip to sw of trend.
Hale	Anton	Stanolind Oil & Gas Co.'s Lee Irish 1, c ne ne HE&WT Ry 18, blk DT, 3⅝ mi e ext.	1-18-46	5- 3-46	5881	5511- 5881	Clear Fork (basal) li; Perm	P 354	32	Ant; geol-geop	1st producer for county. Higher structrly than wells in fld proper.
Mitchell	Westbrook	Hickok & Reynolds, Inc.'s F. A. Langley 1, nw nw se T&P Ry 25, blk 29, T-1-N, 2 mi w ext.	11-10-45	4-30-46	3151	2259- 3151	Clear Fork li; Perm	P 56; 8 wtr	27.5	Ant; geol	Producing from both pays in fld, Permian Basin's oldest.
		WEST TEXAS—New Gas Field									
Sutton		Shell Oil Co.'s Duke Wilson 1, c nw se TW&NG Ry 38, blk B-14, 20 mi s by w of wildcat gasser, nearest prod.	11-29-45	5-27-46	6170	4195- 4215 4220- 4245	Strawn li; Penn	9.3 mln; 2"	....	Ant; geop	Shell controls ar with 6080-ac lse. Not import as no mkt for gas.
		UPPER TEXAS COAST—New Oil Pays									
Chambers	Cedar Point	Standard of Tex's State-Galveston Bay 3-M, 2261 fr nel 2261 fr nwl sect 118, 640-ac lse.	1-11-46	5-22-46	3900	3660- 3665	Miocene sd; Mio	F 116; 5/32"	26.7	SD; grv	.....
Liberty	Liberty, S.	Sun's Shade Fee 12, 2297 fr el 50 fr nl 50-ac lse David Minchey Lge, 100 e of well 1, abnd test.	4- 1-46	5-10-46	4900	4585- 4615	Cook Mtn sd; Eoc	F 103; ⅛"	37.2	SD; geol	Important new sand.
Liberty	McCoy	Ohio Oil Co.'s B. E. Quinn 2-A, 1980 fr s&el 1071-ac lse, Daniel Donahoe Lge, 5975 se A-1 dry hole.	2- 26-46	4-19-46	9800	9125- 9135	Quinn (Wilcox) sd; Eoc	F 62; ¼"	32.4	Flt; seis	Reported to have cut flt; is prodg from different sd than disc through at same level.
		UPPER TEXAS COAST—New Distillate Pays									
Chambers	Mayes, S.	Humble's Annie Frankland et al 1, 467 fr wl 52-ac tr out of 561-ac lse, and S. Mather sur, blk 13.	3-18-46	4-28-46	9900	9103- 9115	Frio sd; Olig	F 32; ¼"	54.9	SD; seis	May be new pay or flt in disc sd.
Chambers	Red Fish Reef	Humble's State-Galveston Bay 35-A, 660 fr se&swl sec 225, State Tr 28499, 640-ac lse.	1-30-46	5- 6-46	11242	11038-11067	Frio sd; Olig	F 76; 1.5 mln ¼"	51.4	Flt D; seis	Also extends fld about 1 mi e.
Matagorda	Sugar Valley	Skelly's B. N. Cooke 1, 417 fr swl 332 fr nwl 55-ac lse, P. Burnett-A. S. Sojourner sur.	2-28-46	4-25-46	8400	7674- 7685	Frio sd; Olig	F 8; 1.1 mln; 1/64"	52	SD; seis	.....
Wharton	El Campo	Seaboard of Dela's Gertrude Peterson 1, 467 fr s&el sect 49 ETRR sur, 160-ac lse, 2 mi ne prod.	3-17-46	4-11-46	7595	6921- 6927	Frio sd; Olig	F 14; 36 mln; ⅛"	50	Flt	.....
		UPPER TEXAS COAST—Distillate Field Extension									
Brazoria	Chocolate Bayou	Phillips' M. V. Armstrong 1, 660 fr se&nel 125.08-ac lse, Hooper & Wade sur 15, 1 mi n ext.	2-22-46	5-23-46	11653	10644-10659	Frio sd; Olig	F 72; 5/16"	50	SD; geol-seis	Good Extension.
		LOWER TEXAS COAST—New Oil Fields									
Brooks	Gyp Hill	Sun's Mary M. Lasater 4-B, 470 fr el 1780 fr sl GB&CNG sur 331, 991 n ne Lasater 3-B dry hole.	3-16-46	4-25-46	4075	4070- 4075	Frio sd; Olig	F 41; ¼"	43.7	SD; seis	Unimportant.
Jim Wells		R. E. Fair et al's Raynolds & Richardson 1, 330 fr s&el lot 19, Seefeld Farm Lots sbdn, W. N. Staples sur 210, 1 mi w Magnolia City fld. 1000-ac farmout.	3-30-46	5-13-46	5883	5402- 5414	Frio sd; Olig	F 76; 11/64"	41	.....	.....
		LOWER TEXAS COAST—New Distillate Fields									
Bee	Sliva	Bridwell Oil Co.'s Sliva Est 1, 330 fr n&nwl 100-ac lse, w cor F. O. Skidmore sur 4, 4½ mi s sw Yougeen gas prod, 3½ mi nw Tynan fld, 7½ mi ne Lucas fld.	3-15-46	4-18-46	4555	4377- 4390	Stillwell sd; Olig	10; .1 mln; 7/64"	48.7	Flt; seis	Thin section. Unimportant.
Brooks		Shell's Cage Ranch 1, 758 fr wl 2879 fr nl J. Guzman sur, 24,242-ac lse, 3½ mi mi nw of Barrosa.	6-15-45	5-15-46	10009	.....	.....	80; 4.5 mln; ¼"	....	.....	.....
Jim Wells		Shell's Wm. Van Hoogenhuyze 1, (OWWO) 660 fr n&el lot 6 blk 10, Burton & Danforth sbdn of Parrita rch, 232.65-ac lse, de la Garza gr.	9-24-45	4-25-46	10086	9023- 9038	.....	108; 17.8 mln; 3/16"	48.2	Flt	.....
Willacy		Magnolia-J. S. Abercrombie Co.'s C. E. Todd 1, 1936.4 fr wl lot 6, 675 fro sl 11t 7 blk 1 on 500.5 ac lse, San Juan de Carricitos Gr; abt 2 mi nw of La Sal Vieja fld.	10-17-46	5- 1-46	11651	7540- 7560	.....	40; 4 mln; 5/16"	55	.....	.....
		LOWER TEXAS COAST—Distillate Field Extension									
Bee	Sliva	Bridwell Oil Co.'s J. W. Baird 1, 330 fr s&el J. G. Rountree sur 8, on 350-ac lse. 1 mi w ext.	4-14-46	5- 6-46	4407	4392- 4395	Stilwell sd; Olig	18; 1 mln; 5/32"	....	.....	.....
		SOUTHWEST TEXAS—Oil Field Extension									
Starr	Boyle-Rincon	Geo. H. Echols' M. M. Garcia 2, 330 fr s&el blk 29 tr 215 Porc 90 on 40-ac lse, nw Boyle, sw Rincon fld (4400 w of m/nly/well at Boyle) ¾ mi w ext.	4- 5-46	5- 4-46	4106	3394- 3412	Frio sd; Olig	F 20; ¼"	42	Flt Ant	.....
		SOUTHWEST TEXAS—New Gas Pay									
Webb	Albercas, N.	Blanco Oil Co.-Al Buchanan's A. M. Bruni Est 5, 765 fr el 100 fr sl blk 28, Brown sbdn Albercas Gr, 480-ac lse.	3-14-46	4-11-46	2649	2520- 2532	Pettus sd; Eoc	No gge	....	Sd lense; cd	Not important.
		WYOMING—New Distillate Field									
Uinta		Mountain Fuel Supply Co.'s Unit 1, ne sw nw 8-16n-112w Church Buttes structure.	.....	5- -46	12895	12550-12606 12640-12674	Dakota sd; L Cre	500; 50 mln; ¼"	46	.....	Rocky Mountain regions' deepest well.

[1] Character of producing formations abbreviated thus: ch, chalk; dolo, dolomite; li, limestone; sd, sandstone; sh, shale; ser, serpentine; cgl, conglomerate. Ages of formations abbreviated thus: Pleis, Pleistocene; Plio, Pliocene; Mio, Miocene; Olig, Oligocene; Eoc, Eocene; U. Cre, Upper Cretaceous; L. Cre, Lower Cretaceous; Jur, Jurassic; Tri, Triassic; Perm, Permian; Penn, Pennsylvanian; U. Miss, Upper Mississippian; L. Miss, Lower Mississippian; Devo, Devonian; Sil, Silurian; Ord, Ordovician; Cam, Cambrian.
[2] Barrels of oil per day (24 hr. rate), flowing (F), pumping (P), swabbing (Sw), or bailing (B); or million cubic feet of gas daily open flow capacity; size of choke given in inches. [3] Type structure abbreviated as follows: Ant, Anticline; D, Dome; Fld, Fold or Folded; Flt, Fault or Faulted; M, Monocline; N, Nose; SD Salt Dome; Str trp, Stratigraphic trap; Syn, Syncline; Ter, Terrace. [4] Method of discovery abbreviated as follows: cd, core drilling; dr, drilling; geol, geology; geop, geophysics; grv, gravity meter; ran dr, random drilling; seis seismograph; sub, subsurface geology; sur, surface geology.

May Completions Lag But Year's Total Leads 1945

WELLS were completed at a lower rat eduring May than in the preceding month, but total completions for the year still maintained almost a 12 percent lead over those of the comparable period of last year. With the steel strike-born tubing shortages becoming a reality in the fields, this margin of difference in drilling is likely to be narrowed before the problem is alleviated.

During May there were 2583 wells of all classes completed, an average of 517 weekly, representing a decrease from the 553 weekly during April, but topping the 465 averaged during May, 1945.

Well completions for the first five months of the current year total 11,173, an increase of 11.9 percent over the 9990 recorded during last year's five months. A major part of this increase over the preceding year is accredited to Texas, Oklahoma, Colorado, Illinois, Indiana, Kansas, Kentucky, Louisiana and Ohio.

Texas completions for the five months totaled 3338 against 3002 for last year, an increase of 11.2 percent, while Oklahoma was up 9.7 percent, from 954 to 1046 wells. Colorado completions were up from 11 last year to 48 at the end of May, and Illinois rose from 671 last year to 841. Indiana's total was up from 116 to 160 wells, while Kansas' completions gained from 636 to 841.

On May 31 there were 3886 rigs drilling or rigging up in the U. S., slightly less than the 3891 reported active one month before, and considerably less than the 4165 rigs that were working at the end of May of last year. The number of rigs that were shut down at the end of May totaled 513, almost the same as the 515 shut down at the start of the month. The current shutdown total is considerably larger than the 478 reported one year ago. California reported 215 rigs working at the end of the month, a decrease from the 320 active a year ago. Oklahoma has slightly less rigs working, the comparative figure being 470 against 497. Texas' active rig figure decreased from 1170 a year ago to 969, a drop of 201. The largest decreases in working rigs among the Texas districts were reported from the Upper and Lower Coast, Panhandle, and Southwest districts. Montana, Colorado and Wyoming have more rigs actively engaged in drilling operations than they did a year ago.

Well Completions in the United States During May, 1946, and Cumulative for Year

(Figures compiled from weekly reports of editorial men, with following exceptions: Illinois from Illinois Geological Survey; Indiana from Indiana Division of Geology, except for May; Missouri from Missouri Geological Survey; Allegany, New York, Bradford and Kane-Clarendon, Pennsylvania, from the Producer's Monthly; Tennessee from Tennessee Division of Geology)

State or District	MONTHLY COMPLETIONS: May, 1946 — Details for May, 1946 — New Wells *Oil	Gas	Dry	Others[6]	Old Wells Deepened	Total Completions — May, 1946[1]	April, 1946[3]	May, 1945[2]	Total Footage May, 1946	CUMULATIVE COMPLETIONS: First 5 Months — Details for Jan.-May, 1946 — New Wells *Oil	Gas	Dry	Others[6]	Old Wells Deepened	Total Completions — Jan.-May, 1946[4]	Jan.-May, 1945[5]	Percent Change	Total Footage 5 Months 1946	RIGS IN OPERATION — Details for May 31, 1946 — Drilling	Rigs Up	Shut Down	Total Drilling and Rigs Up — May 31, 1946	April 30, 1946	May 31, 1945
Alabama	1					1	1	4	3,301	2		5			7	10	— 30.0	431,899	1		3	1	3	6
Arizona							1					1			1			4,300					1	
Arkansas	9		6			15	17	26	65,142	42	1	27		1	71	68	+ 4.4	275,985	21	1	4	22	15	27
California	133	9	26		9	177	140	235	691,461	603	23	132		26	784	873	— 10.2	3,320,056	184	31	39	215	271	320
Colorado	10		1			11	12		72,245	41	1	6			48	11	+336.4	305,256	59	9	7	68	58	25
Florida	1		1			2	1	4	16,495	1		7			8	8		57,132	7	1		8	8	5
Georgia			1			1			3,433			2			2	3	— 33.3	8,441				1		
Illinois	101		50		7	158	233	149	384,085	514	1	309	1	16	841	671	+ 25.3	2,060,919	200	27	26	227	234	213
Indiana	22	6	17		1	46	38	27	80,808	90	14	54		2	160	116	+ 37.9	290,166	56	17	14	73	66	44
Iowa																1	—100.0		1			1		
Kansas	110	16	57	4	11	198	129	165	625,509	463	91	244	8	35	841	636	+ 32.2	2,683,231	246	9	11	255	254	257
Kentucky	24	11	27		2	64	51	37	100,999	104	44	90		3	241	183	+ 31.7	425,715	39	10	10	49	54	52
Louisiana	89	9	41	1	1	138	94	93	865,564	333	40	160	1	2	536	403	+ 33.0	3,627,684	144	12	16	156	166	175
North	45	8	22			75	51	29	310,383	164	36	79		1	280	125	+124.0	1,314,643	59	8	7	67	72	67
South	41	1	19	1	1	63	43	64	555,181	169	4	81	1	1	256	278	— 7.9	2,313,041	85	4	9	89	94	108
Michigan	30	7	42	4	1	84	55	72	192,688	111	28	156	4	4	303	308	— 1.6	717,336	109	10	17	119	129	110
Mississippi	12	1	5		1	19	18	38	133,004	56	6	29		2	93	158	— 41.1	658,474	27		4	27	38	68
Missouri		1	2			3	4	1	1,455	3	3	5			11	16	— 31.3	9,413	2		4	2	3	8
Montana	5	1	9			15	24	12	38,975	57	2	28	3	3	93	75	+ 24.0	209,510	56	16	9	72	57	55
Nebraska																2	—100.0		4		1	4	2	3
New Mexico	18	7	15		2	42	24	36	134,382	97	15	49		5	166	194	— 14.4	581,906	73	3	15	76	77	86
New York	60		1	33		94	117	96	128,802	271	6	6	152	1	436	407	+ 7.1	620,593	83	12	23	95	115	102
N. Carolina																			1			1	1	
N. Dakota																								1
Ohio	41	45	36			122	85	93	296,206	125	205	144			474	338	+ 40.2	1,176,816	171	24	42	195	200	190
Oklahoma	121	18	66	10	13	228	175	224	719,388	571	88	327	19	41	1,046	954	+ 9.7	3,570,243	444	26	17	470	428	497
Oregon			1			1			9,263			1			1			9,263					1	
Pennsylvania	128	19	9	136	3	295	302	248	503,528	565	84	34	608	12	1,303	1,176	+ 10.8	2,223,774	290	40	67	330	329	297
S. Dakota																			4	2	3	6	4	1
Tennessee							1	1				2			2	2		1,618	5			5	5	1
Texas	472	38	255	3	16	784	624	687	3,322,008	1,996	185	1,073	22	62	3,338	3,002	+ 11.2	14,197,318	922	47	114	969	988	1,170
E. Tex. Bor.	4	9				13	6	5	71,359	10	49	4			63	32	+ 96.9	400,097	33	2	1	35	36	31
RestofE. Tex.	40	1	13			54	46	23	271,579	160	6	57	1	2	226	87	+159.8	1,177,050	51	5	13	56	66	41
North Texas	140	2	109	3	3	257	179	168	645,362	527	3	422	16	11	979	671	+ 45.9	2,483,179	135	6	9	141	148	162
W. Central	17	3	36		1	57	42	38	151,886	97	14	134	1	5	251	191	+ 31.4	671,600	77	1	41	78	74	85
West Texas	121	1	20		5	147	127	188	732,184	550	7	104	2	18	681	794	— 14.2	3,244,206	372	10	13	382	357	387
Panhandle	12	8	6		5	31	30	38	76,991	70	56	30		19	175	246	— 28.9	481,380	52	6	5	58	53	140
Upper Coast	31	4	23			58	60	69	438,439	163	16	109	1		289	300	— 3.7	2,078,811	52	1	7	53	74	100
Lower Coast	88	7	23		2	120	79	103	755,339	326	20	99		6	451	432	+ 4.4	2,883,072	109	9	13	118	122	152
Southwest	17	3	13			33	42	43	111,241	76	14	72	1	1	164	211	— 22.3	549,850	18	3	3	21	33	49
S. Central	2		12			14	13	12	67,628	17		42			59	38	+ 55.3	228,073	23	4	9	27	25	23
Utah										1		1			2			2,795	6	3	1	9	6	
Washington			1			1			6,230			1			1			6,230					1	1
West Virginia	3	47	10		7	67	62	74	171,773	30	205	51		14	300	315	— 4.8	801,518	322	28	52	350	324	386
Wyoming	14	1	2			17	6	3	72,352	47	6	11			64	60	+ 8.3	287,571	68	13	14	81	55	65
Total U. S.	1,401	236	681	191	74	2,583	2,214	2,325	8,639,096	6,123	1,048	2,955	818	229	11,173	9,990	+ 11.9	38,165,162	3,545	341	513	3,886	3,891	4,165

* Includes distillate wells. [1] Wells completed in 5 weeks, or 35 days, ended June 1, 1946. [2] Wells completed in 5 weeks, or 35 days, ended June 2, 1945. [3] Wells completed in 4 weeks, or 28 days, ended April 27, 1946. [4] Wells completed in 22 weeks, or 154 days, ended June 1, 1946. [5] Wells completed in 22 weeks, or 154 days, ended June 2, 1945. [6] Water input, gas injection, and salt water disposal wells.

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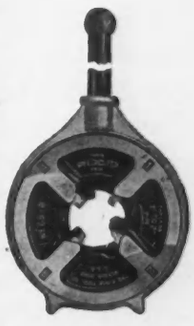

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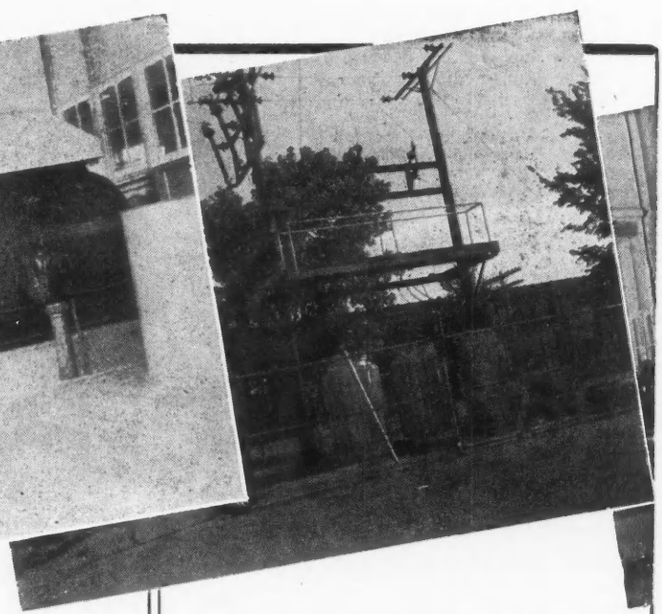
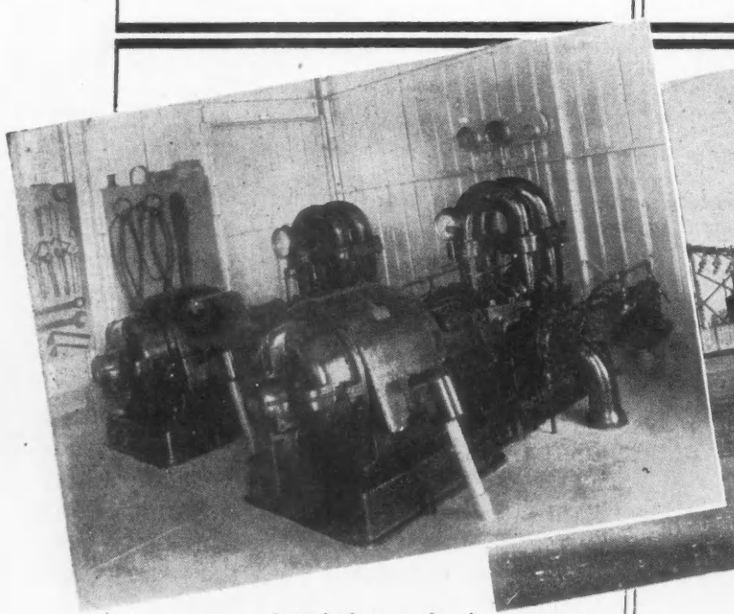
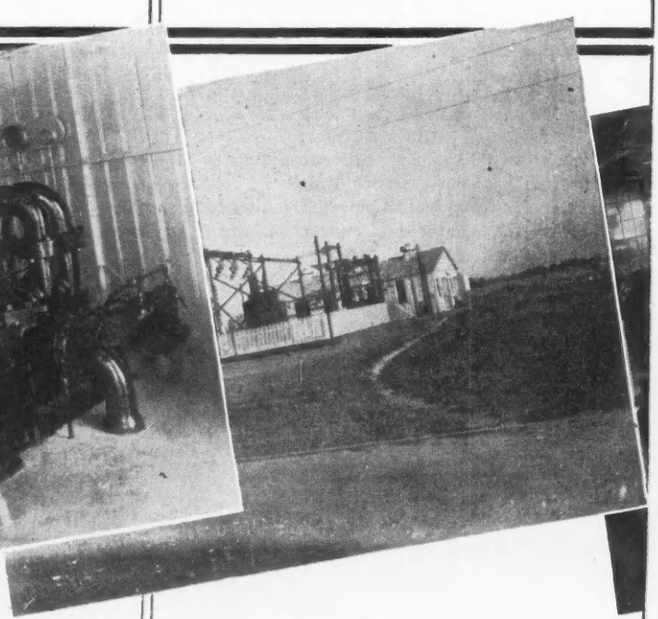
A typical installation of motors and ventilating air ducts of a WEP 20" products line station.



A transformer bank and transmission line to a main line major company pumping station in Oklahoma.

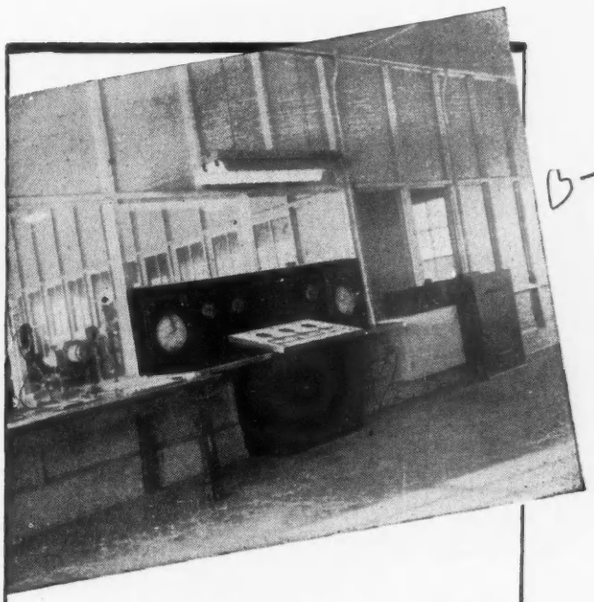


A typical example of how Utility Electric Power is being utilized for efficient and economical operation of pipe line stations throughout America.

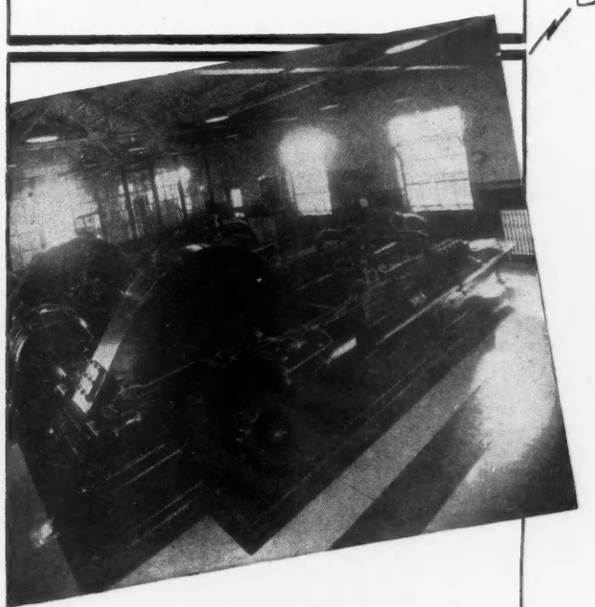


Exterior view of a WEP 24" crude oil pump station.

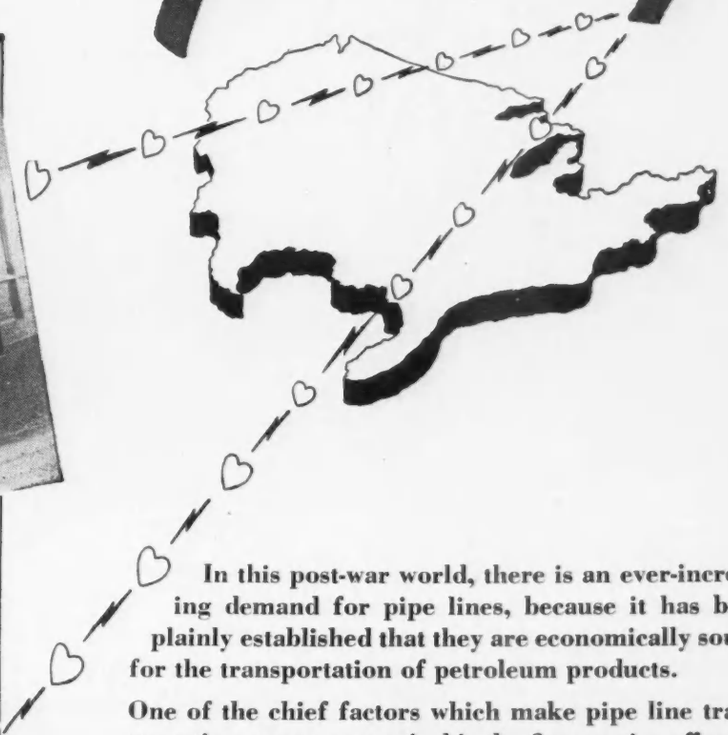
the nation's pipelines *Pulsing*



The control desk with view of the pump room through the glass partition in a WEP 20" products line station.



Pipe line stations like the one above are delivering thousands upon thousands of barrels of oil and gasoline daily to vital points of distribution at rock-bottom costs.



In this post-war world, there is an ever-increasing demand for pipe lines, because it has been plainly established that they are economically sound for the transportation of petroleum products.

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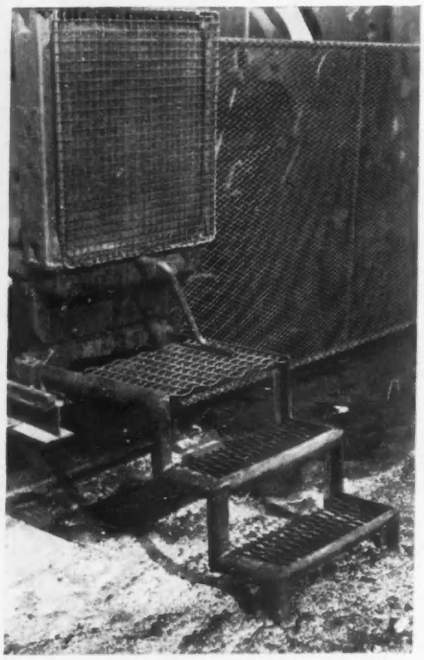

The small all-steel steps employed by one company for use at the front of pumping unit engines are unusually simple in fabrication and installation. Easily built up in the welding shop, the step embodies ample strength together with non-skid step surfaces, plus a siding that eliminates rough edges that usually contribute their share to ripping employe's clothes. Short lengths of two-inch tubing cut to the proper dimensions are cut in half longitudinally and welded together, the step surfaces being of welded sections of expanded metal as shown.

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The half-round structural material incorporates inherent strength with minimum weight, the assembly and welding of the unit being facilitated by the fact that the matching sides of the structure are identical, each piece having been cut to proper length and angle before being split in half lengthwise.

The inherent strength of these steps is sufficient to permit them being set up at the unit without need of auxiliary supports, the two outer legs resting on the ground with the upper portion fastened to the engine rails.

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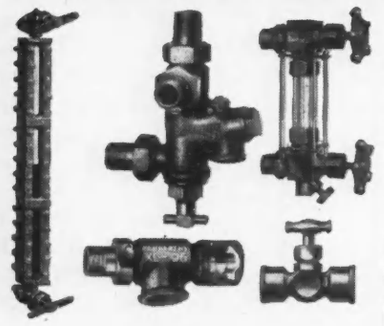
QUALITY
PRODUCTS



Penberthy liquid level gages of various types—injectors—ejectors—all so widely used throughout the oil industry because they have always been dependable under the most severe service conditions.

All are of rugged construction and made by an organization with 57 years experience in the manufacture of quality products.

See Pages 2450 to 2455, Composite Catalog

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

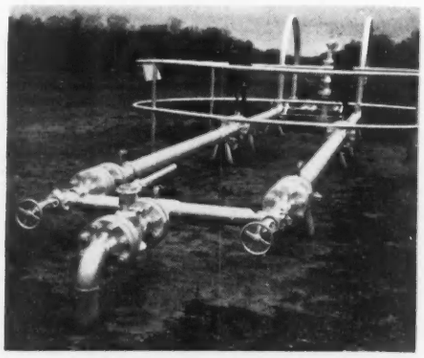
Easily Seen Float Guage Gives Guage In Inches

One of the objections to float-type, externally indicated field tank gauges has been the relative inaccuracy of the readings as obtained by the pumper or gauger. While not intended for gauging of the accuracy needed for well-gauging or oil shipping, nevertheless it is desirable in many installations to be able to read the level to the nearest inch, instead of the nearest foot and fraction thereof. One company utilizes an improved shop-made type of float indicator which can be read easily by the pumper and without close inspection of the installation each time it is read. The indicator consists of the conventional vertical board having feet marked on the sides. The float marker, however, was marked off in inches, with the numerals increasing in ascending order on the board as shown.

GAUGING

Close inspection of the illustration will show the ease with which it may be read, the board in this instance showing that four inches of fluid remain in the tank. If lines and numerals are printed clearly it is even possible to read to the nearest one-half inch with fair accuracy. If the indicator board is cut so as to just fit inside the edges of the guide rail, readings can be taken accurately fram nearly any angle.

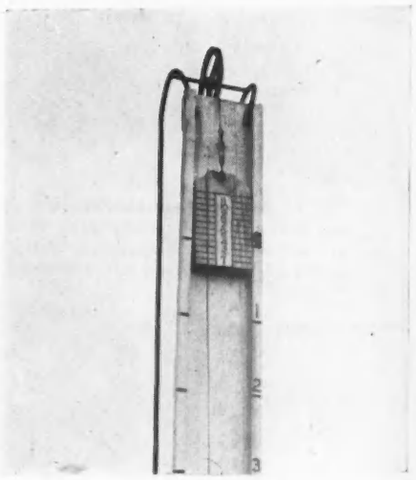
Adjustable Wing Valves



A unique and practical arrangement of flow lines is employed by a producing company to regulate and accurately measure the amount of gas injected into a feed well of a pressure-maintenance project. The gas line approach to the injection well was stopped about 15 feet from the well head and a plug valve and manifold were added. At each end of the manifold an adjustable wing valve was connected to two 6-inch metering lines which were formed into a semi-circle at the end of the metering run adjacent to the well head. Approximately mid-way on the two 6-inch metering lines are located orifice flanges to which is attached the orifice meters.

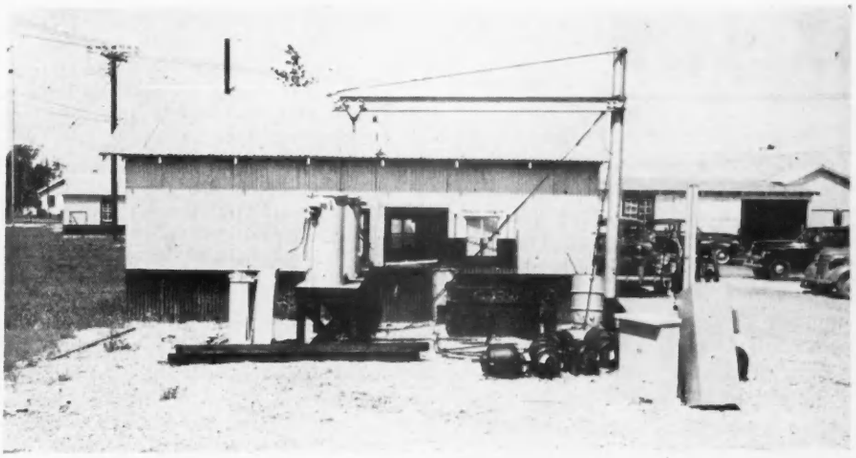
FLOW CONTROL

Micrometer adjustments provided by the adjustable wing valves make it possible to precisely control the input volume of gas. Use of the wing valves and the two meter runs eliminates much of the troublesome pulsations which make it difficult to obtain accurate measurements of the gas input volume. The entire piping system is supported at various points by small sections of pipe which are welded to the 6-inch line to form legs. This makes the wing valves accessible, and with the main line valve above ground as shown, the lease man can tell at a glance if the valve is open or not by the position of the valve handle. Here it is shown open.



PRODUCTION HINTS

Crane for Transformer Repairs



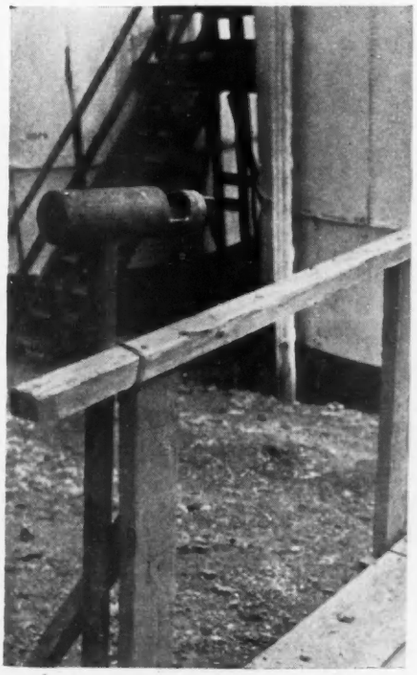
Transformers and the motors used in electric drive of pumping units are heavy for their size, and usually require the presence of a helper or "swamper" around the repair shop solely for the chore of helping to move the units from bench to test rack and thence to the truck.

MATERIAL HANDLING

One company which uses electric drive almost exclusively in its pumping work set up an electric overhaul station in the most convenient location in the field, flanking the building with a heavy platform on which transformers and motors could be unloaded by the field maintenance gang. To facilitate transfer of the units from this storage space to the shop, a jib crane was set up so that it would span the platform, the projecting end of the working platform within the shop, and the roadway adjacent to the building. With a power hoist on the traveler of this crane, one man could move any transformer or motor unit used on the lease, and place the unit to be reworked on a set of rollers on the end of the shop platform so that he could move the work into the shop readily.

The combination of boom travel and hoist lift made it possible to shift equipment from truck to platform over or around intervening units, and without the addition of a crew other than the men actually engaged in maintenance.

Weather-Proof Container Aids in Gauge Reporting



Leaving gauge reports and production data in a convenient place to be picked up later by another person is greatly facilitated by the production department of one company by installing small weather-proof receptacles that are stationed beside the roadway near each of the several field tank installations. A short cut-away section of 2½-inch pipe inserted into a partially-closed section of three-inch provides the receptacle which is mounted atop a pipe standard sunk in the ground beside the walkway.

REPORTS

As illustrated, the inner section is closed at the outer end and has a small handle welded to it. Messages are placed inside the inner chamber or "drawer," after which the container is shoved inside the other. Having an overlap of an inch or more at the exposed end, it is not likely that dust or rain will enter the receptacle. The device is small, yet heavy enough that it will withstand buffeting by the wind with no fear of the drawer being shaken open.

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Clean Out with a
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See Composite Catalog Page 1907

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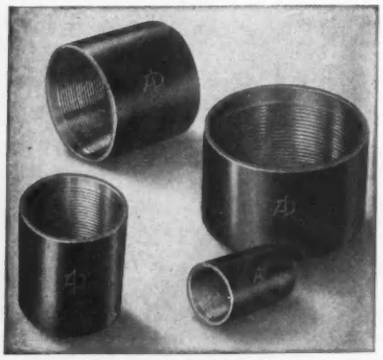
2 Well-Known Harrisburg Steel Corporation Products

Seamless Steel
COUPLINGS

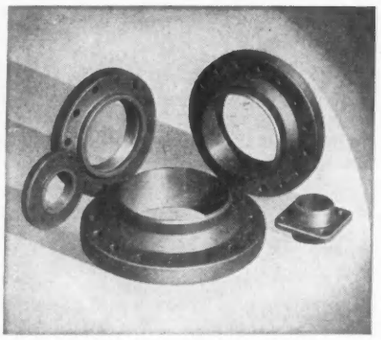


Harrisburg Seamless Steel Pipe Couplings are superior because they are the result of carefully controlled inspection and twenty-five years of manufacturing experience. They are threaded by a special process designed and perfected by our engineering staff, and these threads are unexcelled in accuracy of form, height, angle and lead.

Specify these pipe couplings and judge for yourself how Harrisburg's special steels and machining methods have achieved this superiority.

Drop-Forged Steel
FLANGES

Harrisburg Drop-Forged Steel Flanges are noted for their strength, endurance and accuracy of machining. These flanges not only have a wealth of extra ruggedness but their threads are so carefully machined that they will stand any test as to fullness and uniformity. The threads of Harrisburg Flanges are perfect in height, angle, taper and gauging. A complete line of Harrisburg Flanges in standard type or for special purposes is available.



Send for These NEW Catalogs

The new Harrisburg Pipe Coupling Catalog is complete in every detail. The tables of information are printed in large, readable type for quick and easy reference.

We also have available for immediate distribution a complete informative catalog on Drop-Forged Steel Flanges.

HARRISBURG STEEL CORPORATION
Harrisburg, Pennsylvania
Alloy and Carbon Steel • Seamless Steel Cylinders, Liquefiers, Pipe Couplings and Slush Pump Liners
Drop Forgings and Drop-Forged Steel Pipe Flanges • Coils and Bends

Internal Pipe Line Tools

■ CONTINUED FROM PAGE 82

Briefly, this swabbing operation follows the procedure given below:

A. Line is laid from the starting point in a continuous section for a distance of about five miles where it is left apart for running the air swab.

B. Swab is inserted at the starting point and propelled through the line by compressed air.

C. The swabbing operation continues in this manner as the line construction progresses.

D. Immediately after a section of line is swabbed, it is tied into the newly completed portion of the line by welding.

E. The completed portion of the line is kept closed at all times, except when crew is making a tie-in weld to connect other swabbed sections of pipe.

A large air compressor, having a displacement of at least 240 cubic feet of air per minute, is most suitable for this operation, especially where lines of large diameter pipe are being swabbed.

By air swabbing, the entire line is cleaned and tested for obstructions before being placed in service. Before this method was developed, pipe line operators frequently encountered trouble after the line was filled with oil, due to some obstruction which did not permit passage of the internal cleaning tool; consequently, it was necessary to evacuate the line to correct the trouble.

The separating tool, referred to above in Paragraph 4 has been effective in batching operations. Present crude oil refinery practices make it desirable to preserve the identity of crude from certain producing areas, which may differ greatly in specific gravity and viscosity from crudes in neighboring areas, and require separate deliveries to the refinery. Delivery of two or more separate and distinct grades of crude through a single-line pipe lines system is accomplished by "batching"; that is, the batches of different grades, which may be ten or several hundred thousand barrels in volume, are pumped through the pipe line in successive rotation, one immediately behind the other.

These batching operations, through pipe line systems usually several hundred miles long, present many problems, one being to prevent mixture or intermingling of the crudes at the interface of the opposing columns as they travel through the pipe line; in other words, to prevent a mixture between the heads and tails of the batches.

It became evident that a separating device should be used and a special tool (See Figure 4) has been developed and used effectively as a separator between batches of crude oil. It has proved practical, especially in handling the heavy viscous crudes from the Rocky Mountain areas.

In conclusion, it may be said that these new pipe line tools represent sound engineering practices, and each tool described has been tried and proved in actual use by several oil pipe line companies and gas pipe line companies. Therefore, the development of these modern tools is regarded as an important contribution to the pipe line industry.

Texas-California Gas Line

■ CONTINUED FROM PAGE 99

lion cubic feet per day residue gas from a gasoline extracting plant to be built by Gulf in the Keystone field in Winkler County; with Shell Oil Company for 20 million cubic feet daily residue gas from a gasoline extraction plant to be built by Shell in the TXL and Wheeler fields in Ector County, Texas; and with Warren Petroleum Company for 10 million cubic feet residue gas from the Monument field in Lea County, New Mexico. These contracts are for terms from 15 to 25 years.

Under date of December 17, 1945, the El Paso company entered into a contract with Southern California Gas Company and Southern Counties Gas Company of California, under which the El Paso company undertakes to deliver to them at the Colorado River near Blythe, Cal., up to 125 million cubic feet of natural gas per day during the first year of the contract term and up to 175 million cubic feet of gas per day thereafter, with an option to the California companies, exercisable on or before September 1, 1949, to increase their takings under the contract to a maximum of 305 million cubic feet of natural gas per day. The California companies are to construct a line from the point of delivery at the Colorado River to a connection with their present distribution system near Los Angeles. The contract, which is to continue for a term of 30 years from the initial delivery of gas thereunder, obligates the California companies to receive minimum deliveries, averaged over the year, of 91 percent of the maximum contracted daily demand from time to time in effect, as indicated above.

Construction Approved

Upon application of the California companies and after hearings, the California Commission on February 5, 1946, issued its opinion and order approving the construction of the line from Blythe to Los Angeles, and emphasizing the need of the two California companies to obtain additional gas to supplement the diminishing supplies available to them from California sources and to enable them to meet the full anticipated demands in their service areas.

The California companies also made application to the Federal Power Commission for authority to construct and operate their portion of the new project as an interstate line. Such application was, by order of the Commission, consolidated with the El Paso company's application for purposes of hearings, and an initial hearing on the two applications, for the presentation of direct evidence, was had in Washington, D. C., in February of this year. Further hearings for additional direct evidence and cross-examination were had in Los Angeles from April 8 to 15, 1946. No organized opposition to the applications appeared at any of the hearings; on the contrary, the city of Los Angeles, the city of San Francisco and the Chamber of Commerce of Los Angeles, through their respective representatives, appeared at the hearing in Los Angeles and urged the granting of the applications.

During the Federal Power Commission hearings in Los Angeles, executives

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IT'S THE FOOTAGE OF HOLE IN THE OIL SAND THAT COUNTS

Most oil wells cost

more than $1000 per foot to drill

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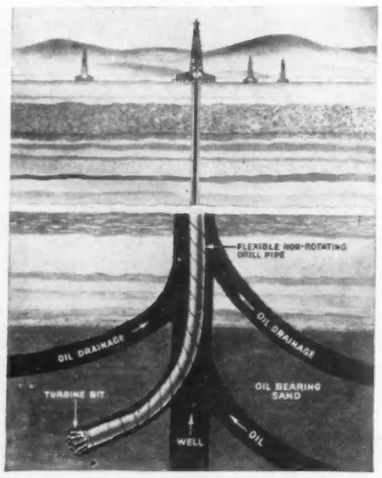
Cost of drilling an oil well from the grass roots down through oil sands is determined by the footage of oil sands. You can't produce anywhere but from the oil sands.

Therefore, if your well cost $50,000 to drill and you get 50 feet of oil sand, your drilling has cost you $1,000 per effective foot.

But, by drilling full size horizontal drain holes, to that 50 feet of pay sand you increase the drainage capacity of your well in an amazing ratio.



For instance, drill 6 horizontal holes 80 feet in length and you add 480 more feet of drain area to the 50 feet of vertical drain area.

That's something to think about and worth investigating.

We are prepared to take full responsibility for drilling horizontal drain holes in your wells.

The drilling of drain holes requires no additional casing.

Full details, test records and costs upon request.

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Zublin

HORIZONTAL WELL DRILLING

of the California companies stated on the record their conviction that their companies would need the full 305 million cubic feet of gas per day, in all probability at an earlier date than was originally contemplated, and made a formal offer to exercise at this time their election to take the full 305 million cubic feet of gas per day, pursuant to the terms of the contract, if the Federal Power Commission should deem such action on their part necessary to permit the issuance of unconditional certificates of public convenience and necessary covering the entire new project, as asked by the El Paso company and the California companies. The Commission, however, did not require the exercise of the option prior to September 1, 1949, but granted the certificate for the full 305 million capacity conditioned only upon the exercise of the option by September 1, 1949.

The El Paso company has already contracted to finance the cost of the project through the issuance and sale of appropriate amounts of new first mortgage bonds and preferred stock, the contracting of a bank loan and the offering of 100,057 additional shares of common stock for subscription by holders of the common stock then outstanding at an appropriate price at the time of offering. It is contemplated that the price of the additional common stock will be such as to make the "rights" readily marketable. The new preferred stock to be issued is expected to have a dividend rate between 4 and 4½ percent per annum, depending upon market conditions when the offering is made.

Engineering Features

There are no unusual engineering features on the El Paso company's portion of the project. There is one interesting feature on the California companies' portion. These companies are using 30-inch pipe to operate at pressures in excess of 800 pounds per square inch. The purpose is to supply storage to cover hourly peaks in the delivery of the gas into their distribution systems. The companies' engineers developed the fact before the Federal Power Commission that the storage capacity so provided was far cheaper than any other form of storage that could be constructed.

The El Paso Company's portion of the pipe line will be constructed of 737 miles of 26-inch pipe and 251 miles of 24-inch pipe. The 26-inch pipe will be half with a wall thickness of .291 and one half with a wall thickness of .281, the thicker pipe being placed in the discharge side of the compressor stations. The pipe has been ordered. The line is designed to operate at maximum pressures of approximately 810 pounds per square inch. The line will be solid welded in the main by the pressure welding method.

The compressors will be the vertical type with 800 to 1200 horsepower engines.

Most of the El Paso company's portion of the pipe line will be constructed along the route of the present line of the El Paso company to Arizona, and will be constructed directly by the El Paso company.

It is expected that it will require approximately one year to construct the initial stage, and approximately 18 months to complete the pipe line to a capacity of 175 million cubic feet per day.

Centrifugal Pump Flexibility

■ CONTINUED FROM PAGE 104

brake horsepower and brake mean effective pressure are given below. We are including the latter as it seems that engine driven centrifugal pumps are being used more frequently for pipe line service.

For engine limitations there is a wide divergence of opinion regarding the maximum allowable brake mean effective pressure. Some engineers permit a maximum of only 55 psi, whereas others go considerably higher. However, whatever the pre-determined maximum bmep may be, the actual available bhp may be found from the following formula and knowing bhp required, the corresponding bmep is calculated readily.

Engines

$$\text{Bmep} = \frac{\text{bhp} \times 792{,}000}{\text{rpm} \times \text{cu. in.}}$$

or

$$\text{bhp} = \frac{\text{rpm} \times \text{cu. in.} \times \text{bmep}}{792{,}0000}$$

Where

bmep = brake mean effective pressure
bhp = brake horse power
cu. in. = cubic inch displacement of engine
792,000 = A constant

Centrifugal Pumps

$$\text{bhp} = \frac{\text{gpm} \times \text{head in feet} \times \text{sp. gr.}}{3960 \times \text{pump efficiency}}$$

or

$$\text{bhp} = \frac{\text{bpd} \times \text{pressure} \times 1.7}{\text{pump efficiency}}$$

Where

bhp = brake horse power
gpm = gallons per minute
sp.gr. = specific gravity of the fluid being pumped
bpd = barrels per day in thousands
pressure = pressure in hundred pounds
3960 = A constant
1.7 = A constant

Watchorn Oil & Gas Company Stock Purchased by Employes

Employes have purchased the controlling interest of Watchorn Oil & Gas Company, organized in 1916 by the late Robert Watchorn of Redlands, Calif. The purchase of control of the company was made possible by the closing of his estate. The name of the company has been changed to Porter Oil & Gas Company. J. R. Porter, who was executive vice president of the Watchorn Company for many years, will be president under the new arrangement; Everett Carpenter will be vice president and Willa Mae Simmons, secretary. There will be no change in personnel, policy or activity of the company. The offices will continue to be at 2715 First National Building, Oklahoma City.

Shreveport Society Elects

T. H. Philpott, The Carter Oil Company, has been named president of the Shreveport Geological Society. Brame Womack, Sohio Petroleum Company, was chosen vice president; and J. Ed Lytle, Union Producing Company, was elected secretary-treasurer.

Sizing Natural Gas Lines

■ CONTINUED FROM PAGE 114

$$Q_d = 5{,}715 \times (d)^{5/3} \times \sqrt{P_1 - 13.20}$$

then using 750 psig as an average value for P_1, we have

$$Q_d = 5{,}715 \times (d)^{5/3} \times \sqrt{765 - 13.20}$$

or

$$Q_d = 156{,}700 \times (d)^{5/3}$$

as the final reduced Weymouth's equation for a ½-pound pressure-loss per 100 feet of pipe line at 750 psig.

Oliphant's basic formula, as used in Curves 3 and 4, for the ½ pound per 100 feet, or five pounds per 1000 feet pressure-loss, is reduced from

$$Q_d = 2{,}104 \times \left(d^{5/2} + \frac{d^3}{30} \right) \times \sqrt{P_1^2 - P_2^2}$$

and as

$$P_2 = P_1 - 5.000$$

so

$$P_2^2 = P_1^2 - 2 \times P_1 \times 5.000 + (5.000)^2$$

and

$$P_1^2 - P_2^2 = P_1^2 - P_1^2 + 2 \times P_1 \times 5.000 - (5.000)^2$$

then

$$P_1^2 - P_2^2 = (P_1 - 2.500) \times 10.000$$

and

$$Q_d = 2{,}104 \times \left(d^{5/2} + \frac{d^3}{30} \right) \times \sqrt{P_1 - 2.500} \times \sqrt{10.000}$$

or

$$Q_d = 6{,}653 \times \left(d^{5/2} + \frac{d^3}{30} \right) \times \sqrt{P_1 - 2.500}$$

then using 55.0 psig as an average value for P_1, we have

$$Q_d = 6{,}653 \times \left(d^{5/2} + \frac{d^3}{30} \right) \times \sqrt{69.65 - 2.500}$$

or

$$Q_d = 54{,}520 \times \left(d^{5/2} + \frac{d^3}{30} \right)$$

as the final reduced Oliphant's equation for a ½-pound pressure-loss per 100 feet of pipe line at 55.0 psig.

Weymouth's flow formula summarized, will simplify in each of the four given design pressure-loss conditions to

⅛-pound pressure-loss per 100 feet

$$Q_d = 786.4 \times (d)^{5/3} \times \sqrt{P_1 - 3.300} \times \sqrt{13.20}$$

$$Q_d = 2{,}857 \times (d)^{5/3} \times \sqrt{P_1 - 3.300}$$

¼-pound pressure-loss per 100 feet

$$Q_d = 786.4 \times (d)^{5/3} \times \sqrt{P_1 - 6.600} \times \sqrt{26.40}$$

$$Q_d = 4{,}041 \times (d)^{5/3} \times \sqrt{P_1 - 6.600}$$

½-pound pressure-loss per 100 feet

$$Q_d = 786.4 \times (d)^{5/3} \times \sqrt{P_1 - 13.20} \times \sqrt{52.80}$$

$$Q_d = 5{,}715 \times (d)^{5/3} \times \sqrt{P_1 - 13.20}$$

1-pound pressure-loss per 100 feet

$$Q_d = 786.4 \times (d)^{5/3} \times \sqrt{P_1 - 26.40} \times \sqrt{105.6}$$

$$Q_d = 8{,}084 \times (d)^{5/3} \times \sqrt{P_1 - 26.40}$$

Table 3 gives the mechanical tabulation of Weymouth's formula data for Curve 5. P_1 in each case is taken equal to 750 psig.

Oliphant's flow formula summarized, will simplify in each of the four given design pressure-loss conditions to

⅛-pound pressure-loss per 100 feet

$$Q_d = 2{,}104 \times \left(d^{5/2} + \frac{d^3}{30} \right) \times \sqrt{P_1 - 0.6250} \times \sqrt{2.500}$$

$$Q_d = 3{,}326 \times \left(d^{5/2} + \frac{d^3}{30} \right) \times \sqrt{P_1 - 0.6250}$$

¼-pound pressure-loss per 100 feet

$$Q_d = 2{,}104 \times \left(d^{5/2} + \frac{d^3}{30} \right) \times \sqrt{P_1 - 1.250} \times \sqrt{5.000}$$

$$Q_d = 4{,}705 \times \left(d^{5/2} + \frac{d^3}{30} \right) \times \sqrt{P_1 - 1.250}$$

½-pound pressure-loss per 100 feet

$$Q_d = 2{,}104 \times \left(d^{5/2} + \frac{d^3}{30} \right) \times \sqrt{P_1 - 2.500} \times \sqrt{10.000}$$

$$Q_d = 6{,}653 \times \left(d^{5/2} + \frac{d^3}{30} \right) \times \sqrt{P_1 - 2.500}$$

1-pound pressure-loss per 100 feet

$$Q_d = 2{,}104 \times \left(d^{5/2} + \frac{d^3}{30} \right) \times \sqrt{P_1 - 5.000} \times \sqrt{20.000}$$

$$Q_d = 9{,}409 \times \left(d^{5/2} + \frac{d^3}{30} \right) \times \sqrt{P_1 - 5.000}$$

Table 4 gives the mechanical tabulation of Oliphant's formula data for Curve 5. P_1 in each case is taken equal to 55.0 psig.

Summary

Correct sizing of Natural Gas Transmission Lines will depend upon several pertinent and interrelated factors. The most elusive is the amount of gas the line should be designed to handle. State or federal monthly allowables, the predicted life and average producing rate for the field, the known or probable gas-oil ratio, and finally the actual contract obligations will determine the average daily volume of gas available during the first and succeeding years.

Values of P_1 and P_2 are more easily determined. For low pressure gathering systems, field separator gpm tests will give gasoline recovery and API gravity of the stock tank oil for optimum operating P_1 pressure of the field separators. P_1 recommendations for high pressure gathering systems will depend upon heater requirements needed to prevent hydrate forming conditions, field equipment pressure ratings, or location of flow regulators at the P_2 end of the pipe line. Plant intake or discharge pressures will be determined by field operating pressures and the pressure required to put the sales gas into the purchasers lines. The final P_2's are the actual pressures specified by the purchaser or the calculated input pressures needed to inject assigned volumes of gas into the formation.

After two of the above "Q_d", "P_1", or "P_2's" have been determined, the operator can use the curves or condensed formulas of this article to quickly determine the correct size of line he needs to carry his gas and give him the third variable for his operating conditions.

REFERENCE

[1] George Granger Brown, "Deviations of Natural Gas from the Ideal Gas Laws," Clark Brothers reprint pamphlet.
[2] IBID.

Radio Aids Efficiency Of Gas Lines

By F. J. McELHATTON
Superintendent of Communications and Cathodic Protection,
Panhandle Eastern Pipe Line Company

AN IMPORTANT measure of the operating efficiency of a major natural gas pipe line system is the continuity of the service which it renders. Anything that enables the company to be forewarned of potential trouble or to shorten the time to repair trouble, if such occurs, is vital to its ability to render the maximum of continuous service.

Since its beginning, Panhandle Eastern Pipe Line Company has operated its own telephone system from the Texas Panhandle to its principal offices in Kansas City, Mo., and has used commercial telegraph and telephone service between Kansas City and major marketing centers in Missouri, Illinois, Indiana, Ohio and Michigan. With the increase in quantity of business and amount of property operated, communication facilities once adequate have not been able to keep pace. After exploring its present and future needs, the management of the company decided that radio telephone equipment provided the best means of obtaining the quickest communication in the event of an emergency, as well as having numerous advantages in the conduct of its business from day to day.

Accordingly, the company has installed and is now operating sixteen 250-watt, two-way radio transmitters. These stations are located along the line, each one of the 15 main line compressor stations having its own transmitter-receiver combination.

These stations are complemented by 60, 30-watt, mobile units which have been placed on various automotive units. The range of the fixed stations is such that communication is possible under the most adverse conditions between each compressor station.

This allows communications to be relayed from or to the chief dispatcher with great flexibility. The range of the portable units is such that they can always reach one of the fixed stations. The latter are "on the air" 24 hours a day. The mobile units are "on the air" all the time that they are in service. They report to the nearest fixed station when they go in service and when they go out of service so that their availability is known at all times.

Use Limited

The use of radio communication, under the rules and regulations of the Federal Communications Commission, is limited under the Special Emergency Classifications. Although much broader use of radio than is permitted under this classification is desirable and should be forthcoming, the permitted uses for it at the present time make it a valuable auxiliary to the other types of communication facilities.

Conditions such as high winds, sleet, ice, rain and floods which cause most of the failures in telephone and telegraphic communications, and also contribute to a large number of failures in underground pipe lines, have a much less serious effect on radio facilities.

The radio equipment which the company has installed operates on an assigned frequency of 39,860 kilocycles and employs the substantially noise-free frequency modulation.

The dispatcher at the Kansas City office is the coordinating center of all production, transmission, and delivery activities. His office should know the exact operating conditions, pressures, temperatures, and any other information which will affect the production, transmission, and delivery of gas to our customers.

The supply of gas and the recompressing of it through 15 main line compressor stations must be kept under perfect control. Varying load conditions call for frequent changes in the operation of production and compressing facilities. This requires that the dispatcher be in frequent communication (as often as once each hour) with all control points so that the demands for natural gas are balanced with the supply.

The dispatcher must also keep abreast of weather conditions so that increased or reduced demands caused by changing weather conditions can be met.

Instances can be cited, where, if the company had been provided with radio communication, repairs of failures could have been expedited, resulting in more efficient operation throughout the entire system. A severe 1944 flood, for example, resulted in failure of pipe line facilities near Boonville, Mo. High water blocked roads leading to the scene of emergency. Therefore, cars were dispatched to find a means of ingress to the point of failure. But when a suitable place was found, considerable time was lost in locating the other automotive units and pieces of equipment.

If radio communication had been available during this period considerable repair time would have been saved and the period of curtailment of gas to customers reduced.

Again, in January, 1937, severe sleet and ice caused two main line breaks, one near the Wabash River in Indiana; the other, near the Louisburg, Kansas, Compressor Station. All telephone communication facilities were out of service. The restoration of transmission facilities was delayed and would have been greatly expedited had two-way radiotelephone been available.

Radio would have been a great help when snow and other natural agents completely isolated the Hansford Compressor Station during the winter of 1943-44. If telephone lines had failed during this period, no means of communication with this compressor station would have been available. Repairs and operation would have been extremely difficult, if not impossible.

There is, of course, always the human element involved in operating personnel. Early in 1944, for example, three members of the engineering department found themselves snowbound while driving from Liberal, Kansas, to Stinnett, Texas. The snow drifted to such a depth and was driven by such high wind that their car stalled at 10 a.m. One of the men managed to walk 12 miles to Stinnett, and a rescue crew was organized. The men were finally rescued at 3 o'clock the following morning, after being stranded for 17 hours. Although this incident did not result in the loss of life, it could have. Radio communication would have made known promptly the plight of these men and made possible their rescue much sooner.

Emergency Value

Today, with the new radio system, it is possible to perform the following emergency functions: (1) In the event of failure of transmission facilities superintendents, foremen, and repair crews can be promptly notified and dispatched to the point of failure. (2) Operating personnel which cannot be reached by regular means of communication, can be speedily warned of sudden changes in weather or flood conditions which might cause danger to property or endanger the employes' welfare. (3) Production of gas from the wells can be controlled either for reduction or increase in quantity during periods of rapidly changing operating conditions, when sufficient time is not available to dispatch special crews from the central operating point, or to handle through the routine of regular operations. (4) Compressor station operation can be controlled when regular means of communication are out of service.

To summarize: Two-way radiotelephone communication is used to further assure continuous and uninterrupted service to the customers where conditions are such that this could not be accomplished with regular means of communication, or where failure to act promptly might endanger life, service, or property.

Patent Roundup

A Regular Feature of THE OIL WEEKLY

In this column are reviewed patents dealing with drilling, producing and pipe line branches of the oil industry that are issued by the United States Patent Office.

Patents recently issued by the United States Patent Office, Washington, D. C., include those listed below.

Printed copies of the patents listed are furnished by the Patent Office for 10 cents per copy and can be had by addressing the Commissioner of Patents, Washington 25, D.C.

Investigating Cased Drill Holes

Jacob Neufeld, Tulsa, has assigned his patent (No. 2,400,593) to Well Surveys, Inc., Tulsa.

This is an electrical process for determining the kind of geological formations crossed by cased drill holes, and consists of transmitting electrical current through the earth between casings of two drill holes to determine the distribution of the current as a measure of the varying formations being traversed by the drill holes.

Oil Well Choke

The patent (No. 2,401,665) for this tool has been taken out by Eugene G. Schick, Dallas, and assigned to Shick-Siegal Industries, Los Angeles.

The choke is a shell with interior and exterior threads; its core, axially bored, is of ceramic material. A bushing of aluminum silicon alloy is inseparably bonded to the exterior of the body, being retained in the shell by threads.

Cable Clamp

This device (No. 2,401,418) has been patented by Paul S. Everley, San Francisco, and is unassigned.

The clamp is formed of separable members, a pair of complementary interlocking halves, which combine to enclose a pair of cable strands. A jamming roller acts against the cables in the enclosure and alone holds together the interlocking halves.

Drill Pipe Spinner

Charles Prather and Fred A. Rydberg, Bairoil, Wyo., have taken out a patent on invention No. 2,400,712, an apparatus which has a support to which a second support is pivoted and on which two spaced driven rollers are mounted for driving engagement with a drill pipe. An idle roller is mounted on the second support for contact with the drill pipe, around which it and the driven rollers are arranged in almost equal distances. A pivoted latch carried by the pivoted support and engaging the first support to lock the two together has a handle by which it is operated and by which means it may be moved to open or closed positions. A drive shaft carried by the first support and having a worm drive connection with the shafts of the driven rollers, drives the rollers in the same direction.

Measuring Length of Line

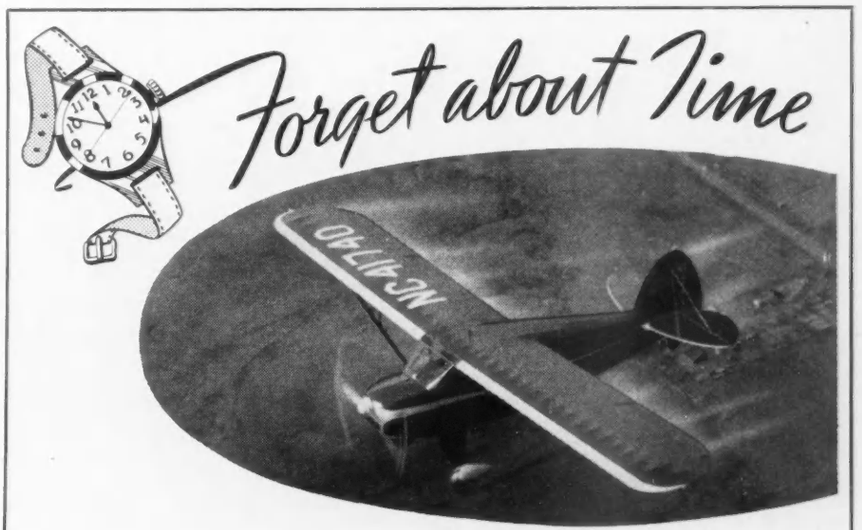
This patent (No. 2,401,576) has been taken out by Richard C. Mason, Tulsa.

The length of line run into or removed from a well can be measured by this arrangement of spaced traction rollers, which engage the line, and a trolley having a number of pressure wheels staggered in relation to the traction rollers. A screw handle device, adjustable to the size of line, moves the pressure wheels toward and from the spaced rollers to vary pressure, and there is a means for indicating the degree of pressure applied and the length of line run.

Adjustable V-Belt Sheave

This power transmitting mechanism (No. 2,401,178) was invented by Alvin W. Oehler and Eric J. Johnson, Moline, Ill., and assigned to Deere & Company, also of Moline.

The mechanism consists of a shaft with a threaded recess in the outer end, a hub non-rotably mounted on the shaft and having an extension which is threaded internally to engage the external threads of a bushing adaptable to being inserted into the hub extension, a head portion engageable with the outer end of the hub and a bolt to be inserted through the bushing and engageable with the threaded recess in the shaft.



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COFFEYVILLE, KANSAS

U.S. Crude Output at All-Time High; Daily Runs to Stills Off Slightly

U. S. crude production during the week ended June 15 topped the previous high mark recorded in July of last year by 17,000 barrels daily to hit an all-time peak.

Daily crude runs to stills for the week were off slightly from the previous week, the refinable crude stocks were reduced considerably during the seven-day period. Gasoline output increased substantially, while production of the light and heavy fuel oils dropped moderately during the week. Gasoline stocks continued to be drawn upon, but at a somewhat slower rate than had prevailed for the past several months, while the combined stocks of the fuel oils were upped by over 1½ million barrels. These trends were revealed in the latest weekly report of The American Petroleum Institute and the latest crude stocks report of the U. S. Bureau of Mines.

Crude production averaged 4,961,000 barrels daily during the week to top the previous all-time daily production high of 4,944,000 barrels set in the middle of 1945. This new crude figure represents an increase of 65,000 barrels daily over the previous week's, and 73,000 barrels more than the average of the comparable week of last year.

The week's daily runs to refinery stills averaged 4,799,000 barrels, a decrease of 28,000 barrels daily from last week's runs, and 158,000 barrels less than the runs of the corresponding period of 1945.

Stocks of refinable crude oil were placed by the Bureau of Mines at 218,589,000 barrels on June 8, showing reductions of 2,296,000 barrels during the preceding seven days. These current crude stocks are 2,963,000 barrels, or 1.3 percent, lower than those on hand June 9, 1945.

Gasoline production, including natural blends at the refineries, totaled 14,510,000 barrels for the week, an increase of 646,000 barrels over the previous week's output, but 430,000 less than was produced during the like period of last year. Stocks of finished and unfinished gasoline were reduced 697,000 barrels during the preceding seven days and at week's end stood at 93,449,000 barrels, a new low mark for the year. These gasoline stocks now held exceed those on hand a year ago by 6,344,000 barrels, or 7.3 percent.

Distillate fuel oil production totaled 5,447,000 barrels for the seven days, a slight increase of 6000 barrels over the previous week's output, and only 7000 over last year's week. Distillate fuel stocks, after additions of 1,624,000 barrels during the week, stand at 35,582,000 barrels, the high mark for the year. Stocks of distillate fuel held a year ago were 5,300,000 barrels less than present holdings.

Residual fuel oil output dropped 84,000 barrels from last week's and totaled 8,931,000 barrels, which is 454,000 less than was produced in the corresponding period of 1945. Stocks of this heavy fuel were reduced 23,000 barrels and now stand at 45,915,000, which is 6.107,000 barrels more than inventories totaled one year ago.

Trends of Operations and Changes in Stocks

Figures on crude stocks are from Bureau of Mines weekly reports; all others from American Petroleum Institute weekly reports, which are estimates on Bureau of Mines basis.

(All figures in thousands of barrels—add 000)

HIGHS AND LOWS OF RECENT YEARS

ITEM	Crude Oil Prod. Barrels Daily	Crude Oil Prod. Week Ended	Runs to Stills Barrels Daily	Runs to Stills Week Ended	Crude Stocks Barrels	Crude Stocks Week Ended	Gasoline Stocks Barrels	Gasoline Stocks Week Ended	Gasoil and Distillate Stocks Barrels	Gasoil and Distillate Stocks Week Ended	Residual Fuel Oil Stocks Barrels	Residual Fuel Oil Stocks Week Ended
Highs:												
1941	4,337	11–22	4,120	10–18	266,187	3–29	99,727	3–29	[5]54,983	11–15	102,448	1– 4
1942	4,337	2– 7	3,961	1– 3	263,208	3–28	[1]109,281	3–14	47,861	11–14	95,857	1– 8
1943	4,436	11–13	4,331	12– 4	245,752	5–29	94,159	3–20	47,187	11–27	72,881	1– 2
1944	4,762	9–30	4,798	12–30	240,992	1– 1	89,162	4– 1	48,162	10–28	64,744	10– 7
1945	4,944	7–21	[5]5,140	8–18	227,554	10–13	99,012	3–24	45,341	11–17	56,074	1– 6
1946	[1]4,961	6–15	4,857	5–25	229,430	3– 2	105,233	2–16	35,582	6–15	45,938	6– 8
Lows:												
1939	[3]1,601	8–26	3,125	2–18	[2]229,127	10–12	71,152	10– 7	20,722	4–15	105,397	4– 3
1941	3,364	1–11	3,490	1–18	240,399	11–15	79,923	10– 4	28,382	4–12	99,914	7–13
1942	3,297	7– 4	3,393	5–23	231,896	12–12	75,934	12– 5	29,240	4–25	72,962	12–26
1943	3,821	1– 9	3,579	3–18	232,191	1– 9	68,182	10–16	30,732	4– 3	57,596	12–25
1944	4,357	1– 1	4,228	2–12	220,258	9– 9	76,302	1– 1	30,232	4–19	49,737	3–18
1945	3,621	10– 6	3,409	10– 6	[4]211,813	8–25	70,791	10–13	26,483	3–17	38,548	5–26
1946	4,403	3– 9	4,498	1–12	218,193	1– 5	93,449	6–15	25,131	3– 9	37,289	4– 6

TRENDS OF 1945 AND 1946

Trends in Week Ended	Crude Oil Production Daily	Crude Oil Runs to Stills Daily	Crude Oil Stocks Week End	Gasoline Production Weekly	Gasoline Stocks Week End	Gasoil and Distillate Production Weekly	Gasoil and Distillate Stocks Week End	Residual Fuel Production Weekly	Residual Fuel Stocks Week End
1945:									
January 27	4,727	4,756	221,310	14,957	88,223	4,843	33,561	9,252	51,119
February 24	4,777	4,803	219,351	15,500	95,972	4,958	28,753	9,084	46,713
March 31	4,781	4,677	223,782	14,644	98,758	4,548	26,889	9,184	41,745
April 28	4,805	4,780	223,474	14,633	94,068	4,636	28,273	9,379	39,813
May 26	4,887	4,950	222,831	15,194	89,121	4,667	29,184	9,670	38,548
June 30	4,903	4,999	220,781	15,546	86,472	4,910	32,213	9,077	40,488
July 28	4,930	4,996	218,507	16,106	86,008	4,598	36,071	9,586	42,283
August 25	4,892	4,931	[4]211,813	15,986	84,693	4,960	39,782	9,356	46,201
September 29	4,357	3,812	222,387	11,913	79,552	3,940	43,689	7,047	46,853
October 27	4,273	4,838	224,230	15,530	74,335	5,159	43,472	8,691	45,943
November 24	4,469	4,648	219,363	15,681	83,184	4,802	45,258	8,800	47,474
December 29	4,474	4,729	218,918	14,546	95,205	5,055	36,651	8,765	42,447
1946:									
January 5	4,548	4,651	218,193	14,488	98,494	5,293	35,199	8,867	42,371
January 26	4,626	4,553	220,544	13,622	101,737	5,720	29,498	8,411	39,722
February 23	4,714	4,595	226,699	13,175	104,709	5,728	25,398	7,913	39,290
March 30	4,425	4,684	224,994	13,896	104,715	5,357	28,240	8,738	37,746
April 27	4,672	4,685	224,443	14,228	99,631	5,568	30,466	9,204	39,404
May 25	4,759	4,857	222,214	14,322	95,769	5,463	32,973	8,908	43,368
June 1	4,756	4,843	220,885	14,293	95,247	5,070	33,172	8,881	44,408
June 8	4,896	4,827	218,589	13,864	94,146	5,441	33,958	9,015	45,938
June 15, 1946	[1]4,961	4,799	.....	14,510	93,449	5,447	35,582	8,931	45,915
June 16, 1945	4,888	4,957	[5]221,552	14,940	87,105	5,440	30,282	9,385	39,808
Change:									
In Week	+65	—28	—2,296	+646	—697	+6	+1,624	—84	—23
In Year	+73	—158	—2,963	—430	+6,344	+7	+5,300	—454	+6,107
In Year	+1.5%	—3.2%	—1.3%	—2.9%	+7.3%	+0.1%	+17.5%	—4.8%	+15.3%

[1] All time peak. [2] Lowest between January, 1922 and July 1, 1944. [3] Lowest since October, 1922 due to shutdown of six Mid-Continent states. [4] Lowest since December, 1921. [5] Stocks, June 9, 1945.

Texas Not to Require Logs On All Wells, As Thought

The policy of the Texas Railroad Commission regarding electric logs on wells in the state crystallized last week with the announcement that there will be no change from present procedure. Logs will be required only on wells which are dually completed.

The hearing notice led operators to believe that the Commission was contemplating an order which would require electrical logs on all wells. A flood of protests resulted.

A. E. Willig of The Texas Company believed that logs are of little value unless other data on a well are submitted, and was opposed to an order requiring them. He said that if logs are required on duals in instances of new discoveries, the unique value which rightfully belongs to the discoverer would be lost.

Gulf Buys Leases

Gulf Oil Corporation purchased three of the choice tracts at an Oklahoma School Land Commission oil and gas lease sale. Gulf paid a total of $2913.75 for lease on half mineral rights on 210 acres lying north of Middleberg, in Eastern Grady County.

☆ Oklahoma

Cities Service Garvin County Test Becomes Pool Opener

Garvin County has another pool; Bridwell makes new play in Cotton Area; Texans start deep test in Perry sector; Chandler area test pays, opens new pool in Lincoln County; work will start on new Okfuskee wildcat; Maysville area test shows oil.

Garvin County: Cities Service Oil Company's Wallace 1-B, wildcat in NW NW SW 18-3n-1w, is a pool opener. Two weeks ago this test surprised the oil industry by discovering the first Bromide high at a depth of only 5312-27 feet. On a recent drill-stem test the well made 30 to 35 barrels of oil an hour, with 2 million cubic feet of gas. When it was drilled to the second Bromide sand, it found salt water, so crews backed up and retested, perforating casing at 5345-65 feet, with 80 holes, and later with 64 holes at 5312-28 feet. Washed in, the discovery flowed 543 barrels of oil in 10 hours, free of water, and testing was continued. The flow was against adjustable chokes.

Cotton County: Bridwell Oil Company, Wichita Falls, Texas, is making a new play southeast of its South Walters pool in southern Cotton County, and recently acquired most of the acreage offered at two sales. The play centers around Sects. 25 and 36-3s-11w. Recently the company was high bidder at a Kiowa Indian Agency sale for all of Sect. 25, and the east half of Sect. 36, and SW of 24-3s-11w. Immediately south of the Bridwell play, R. B. Farris' Wookkuh-mee 1, NW NW SW 1-4s-11w, had a bad pipe job at 1400 feet, but 2000 feet of oil was in the hole, and crews were attempting to clean up and test. Bridwell bought 6 tracts southeast of the South Walters field at a State School Land Commission sale, E½, NE, W½ NW, W½ NW, E½ SE, W½ SE, E½ SW, all in 36-3s-11w. Chief interest in the South Walters field at this time, however, is on the east side, which is about defined. Bridwell has wells in this area, as well as to the northwest.

Noble County: Clark & Cowden Drilling Company, and Paul C. Teas, Dallas, are at work on Clark 1, SW SE SW 32-21n-1w, a wildcat on flank of the old Perry gas field. The test will be a Wilcox sand or 5100-foot test, with Summit Drilling Company holding the contract. James A. Gardner, Tulsa, recently worked the geology around the shores of Perry Lake, and made arrangements for the test. The Eason Oil Company, with a south offset, is supporting, and location for the Clark is about a mile west of production in the 3300-foot sand, and a mile southwest of a Wilcox sand failure drilled several years ago by Barnsdall Oil Company.

Lincoln County: A pool opener in the Chandler area is Fred Morgan's Cash 1, NE NE SW 6-14n-6e, north of the City of Chandler, and northwest of the Chandler pool. The well flowed 10 to 12 barrels of oil an hour from the Oswego at 3932-43 feet, after treatment with 2000 gallons of acid. Total depth is 4310 feet in the Red Fork sand.

Okfuskee County: Porter Oil & Gas Company and J. S. Montgomery Drilling Company took over a block of 380 acres of leases, and staked McMahan 1, SE SE NW 28-12n-8e, near Boley. The test is scheduled for 3800 feet or the Cromwell sand, and work will start immediately. Location is about 2 miles west of the North Dill Pool.

Maysville Area: Mid-Continent Petroleum Corporation's prospective pool opener, the Davenport (Young), 1, NE NE NW 28-4n-2w, south of the city of Maysville in Garvin County, was drilling at 6381 feet, after previously recovering 60 feet of oil-cut mud, with gas bubbles on a 30-minute drill-stem test at 6012-41 feet. Crews cored at 6041-53 feet, to recover 12 feet of dry sand, and then resumed drilling.

Houston Oil Opens Office

The Houston Oil Company of Texas has opened district offices in the Slattery building in Shreveport. W. C. Gibson, Jr., formerly with British American Oil Producing Company, is district geologist, and E. K. Scott is district landman-scout.

☆ Kansas

Ellis Has Arbuckle Lime Pool; Sedgwick Test Has Hunton Show

Arbuckle lime pool opened in Ellis County; Sedgwick County wildcat shows oil in Hunton; wildcat in Rush County looms as pool opener; Kingman townsite has new oil play; Rice County wildcat abandoned in Arbuckle; another pool opener expected in Barber County.

Ellis County: Mazda Oil Company's Henderson 1, CEL SE NE 22-11s-18w, 1½ miles southwest of production in the Burnett pool, is a pool opener. The well swabbed 50 barrels of oil an hour following acid treatment at 3616-36 feet, in the Arbuckle lime.

Sedgwick County: A show of oil was found in the Hunton lime zone at 3875-79 feet at Helmerich & Payne, Inc.'s Williams 1, SW SW SW 18-25s-2w, 8 miles northwest of the Valley Center pool. The well topped the Lansing lime at 2582 feet and the Mississippi formation at 3403 feet. Tools will be taken to the Arbuckle lime, which is expected a few feet below the Hunton.

Rush County: Looming as a pool

Wells Completed in the United States in Week Ended June 22, 1946

Data preliminary and subject to revision. Revised and more complete data on all completions shown in monthly summary of drilling, published in second or third issue of each month. More detailed data on wildcats published in third or fourth issue of each month.

State or District	FIELD COMPLETIONS: New Wells *Oil	Gas	†Input	Dry	Total	Old Wells Deepened	WILDCAT COMPLETIONS *Oil	Gas	Dry	Total	ALL COMPLETIONS: This Week	Last Week	Cumulative This Year	Cumulative Last Year
Alabama													7	15
Arizona													1	
Arkansas	1				1				1	1	2	5	81	80
California	23	1		5	29	3	1		3	4	36	47	909	1,016
Colorado	4	1			5						5		56	12
Florida									1	1	1	2	11	9
Georgia													2	4
Illinois	18			4	22				7	7	29	28	937	784
Indiana	3	1		2	6	1	1			1	8	10	198	141
Iowa														1
Kansas	19	8		3	30	1			5	5	37	41	965	741
Kentucky	2	1		1	4	1					5	8	262	219
Louisiana	11			5	16				2	2	18	29	599	470
North Louisiana	6			2	8						8	19	314	151
South Louisiana	5			3	8				2	2	10	10	285	319
Michigan	4	4		13	21				9	9	30	17	350	359
Mississippi	4				4				5	5	9	4	111	180
Missouri												1	12	20
Montana	6			4	10	1	2			2	13		112	90
Nebraska														2
New Mexico	6			3	9						9	13	193	217
New York	15		10		25						25	25	512	490
Ohio	7		1	5	13						13	17	512	411
Oklahoma	25	1	1	13	40	3					43	44	1,173	1,109
Oregon									1	1	1		2	
Pennsylvania	27	3	15	1	46						46	56	1,455	1,380
Tennessee	1				1						1		3	2
Texas	101	7		25	133	4	4	1	31	36	173	136	3,834	3,443
E.Tex.Bor. Co.'s		2			2		1			1	3	5	73	33
Rest of E. Texas	7			1	8						8	8	258	104
North Texas	35			15	50		2		7	9	59	38	1,130	789
W. Central Tex.	4			2	6	1			2	2	9	13	282	222
West Texas	22			1	23				4	4	27	28	779	930
Tex. Panhandle	2	2		2	6						6	4	198	278
G. Coast, Upper	9	1			10		1		1	2	12	14	326	341
G. Coast, Lower	18	2		4	24	3		1	7	8	35	18	526	492
Southwest Texas	4				4				8	8	12	7	197	239
S. Central Tex.									2	2	2	1	65	45
Utah													2	
Washington													1	
West Virginia	1	11		3	15			1		1	16	8	337	369
Wyoming	3				3		2			2	5		71	63
Total U.S.	281	38	27	87	433	14	10	2	65	77	524	491	12,708	11,627

* Includes distillate wells. † Includes salt water disposal wells.

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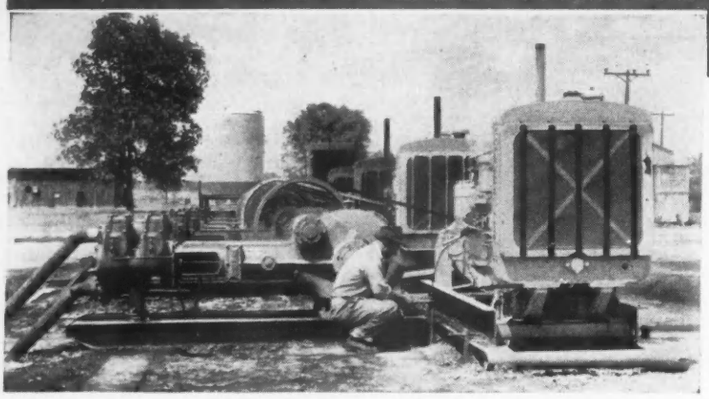

Battery of Fig. 1742 pumps operating 24 hours a day on crude oil line in the Illinois field.

Gaso is a firm of pumping engineers, specializing in the solution of oil-industry pumping problems. To such problems, Gaso brings a matchless combination of experience, knowledge and records—experience with every imaginable pumping condition; knowledge of every type of power unit and hookup; records that include the minutest detail of all of the thousands of installations made since the Gaso company was organized, more than a quarter-century ago.

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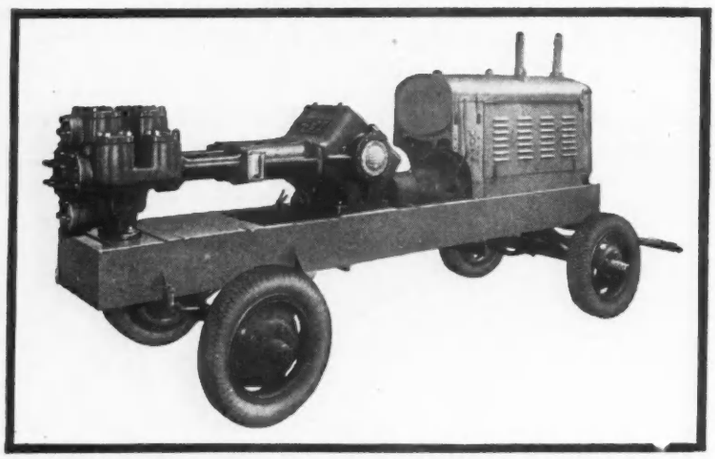

Gaso Fig. 2050 mounted on trailer—ready for export to South America.

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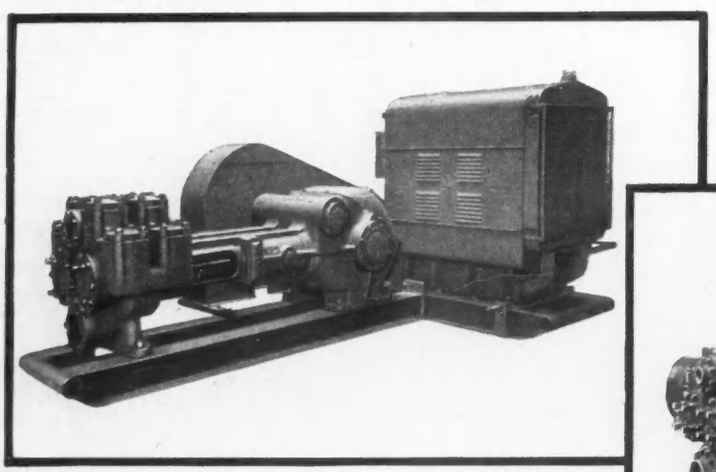
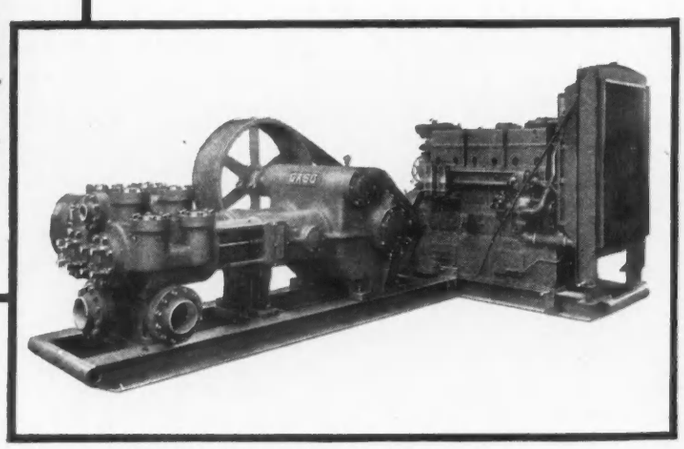


Gaso Fig. 1743 Duplex Piston Power Pump mounted on skid, complete with power unit.



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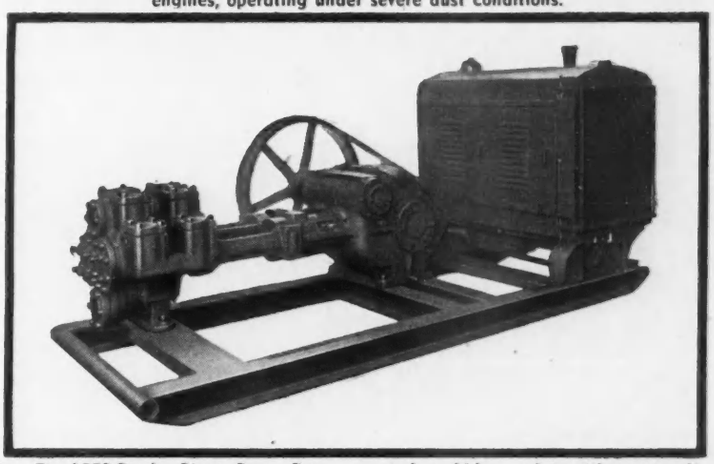

Gaso Fig. 1550 Duplex Piston Power Pump mounted on skid, complete with power unit.

PUMPS

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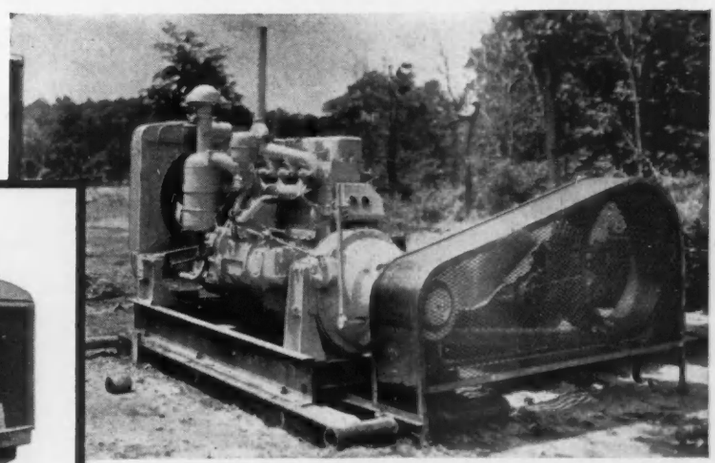
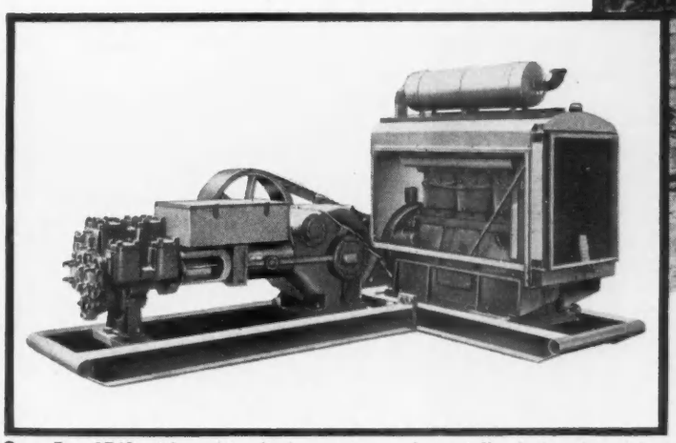


Fig. 1742 Gaso Pump powered by Diesel engine on midwestern pipe line.



Gaso Fig. 1742 with multi-cylinder engine and specially designed tool box.

opener is Hildebrande-Watson Drilling Company's Dwyer 1, SW SW SE 1-19s-16w, southeastern part of the county. The test showed good saturation in the Arbuckle lime, and operators set 5-inch pipe at 3625 feet, total depth.

Kingman County: The city of Kingman in Southern Kansas apparently is heading into an oil play, with J. M. Huber Corporation purchasing leases on the townsite. A. G. Hille is reported assembling a 2500-acre lease block just west of the city. Hill's purchases have been in Sects. 25, 26, 27, 34, 35 and 36-27s-8w, and extending into Townships 27s-8w, and 28s-8w. At one time The Carter Oil Company held most of this area leased. Magnolia Petroleum Company has been purchasing around the edge of the Hill block, with greatest trading being on the south side.

Rice County: Bridgeport Oil Company's wildcat, Boldt 1, NE NW 19-18s-9w, has been abandoned. It was drilled to 3253 feet in the Arbuckle lime with no oil shows. Lansing was topped at 2286 feet, Colglomerate at 3200, and Arbuckle at 3220.

Barber County: A closely watched wildcat is Skelly Oil Company's Boggs 1, SW NE NE 17-33s-15w, 2 miles east of the Medicine Lodge gas field. The test started flowing oil at total depth of 4831 feet in a soft gray sand that has not been defined. Crews are running tubing to test. The hole previously was cleaned out to the bottom and bailed down to 1600 feet when the well started flowing, but no gauge was taken.

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DALLAS 1, TEXAS

Butadiene and Copolymer Plant Disposal Suggested

Sales of the government's butadiene and copolymer plants to private interests should be under a plan assuring continuance of synthetic rubber on an adequate scale, Congress last week was told by the Inter-Agency Policy Committee on Rubber.

Fifteen copolymer plants and ten large petroleum butadiene plants are involved, in addition to four smaller butadiene plants, only one of which is presently operating. Nine of the copolymer plants are located in Texas, Louisiana and California, and of the petroleum butadiene plants, four are in Texas, three in California, two in Louisiana and one in Ohio.

The plants have been divided broadly into "fringe" and "basic" plants, the former being high-cost producers which are not expected to be required at all for synthetic production or stand-by capacity under the proposed national security program.

WAA explained that since the country's long-term synthetic rubber program is dependent upon the basic plants, the government must be assured its disposal action will satisfy the requirements of national security and will not jeopardize the continuous and adequate supply of synthetic rubber.

It suggested therefore that disposal negotiations should proceed promptly and when it appears likely that bids will be submitted on a sufficient number of plants to constitute the nucleus of a strong diversified private industry, the government should invite the simultaneous tender of bids, preferably by the end of the year.

Plants in the "basic" category are to have an annual capacity of approximately 450,000 long tons of GR-S, and sales should be made with the reservations: (1) that the plants must be operated for the production of synthetic rubber during the short-run period of inadequate rubber supply, subject to existing government controls in the light of the continuing rubber emergency; (2) the plants must not, without the consent of the government, be so altered after the short-run period that they are not quickly reconvertible for the production of synthetic rubber, and (3) the government will have the right to re-acquire the plant if the two foregoing conditions are not met.

Basic plants not acquired by private interests should be retained by the government, the report declared, but should not be operated in competition with private industry except in the existing rubber shortage or in any future national emergency.

The committee saw no place in the permanent set-up for the three plants making butadiene from industrial alcohol, because of its higher cost and unreliability of supply, but did suggest that one of the plants be maintained in stand-by condition against an emergency.

Foreign Oil Testimony Is Offered in Book Form

Testimony taken by the Special Senate Oil Company on American petroleum interests in foreign countries during its hearings June 27-28, 1945, has been published by the Government Printing Office.

Copies of the 500-page volume will be sold at $1 each by the Superintendent of Documents. The supply is limited.

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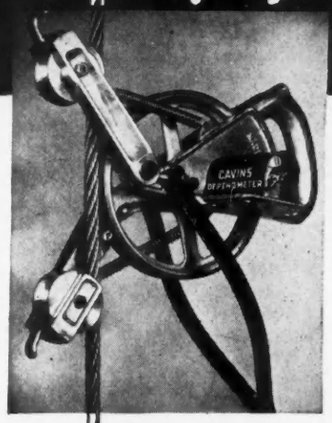

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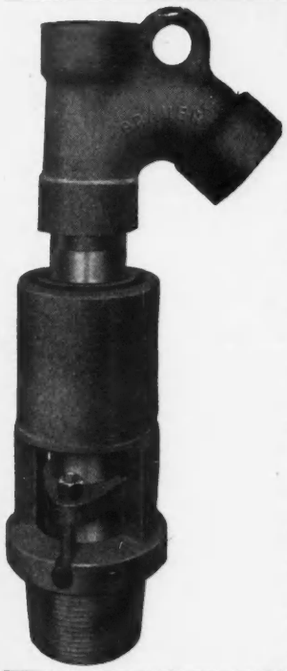

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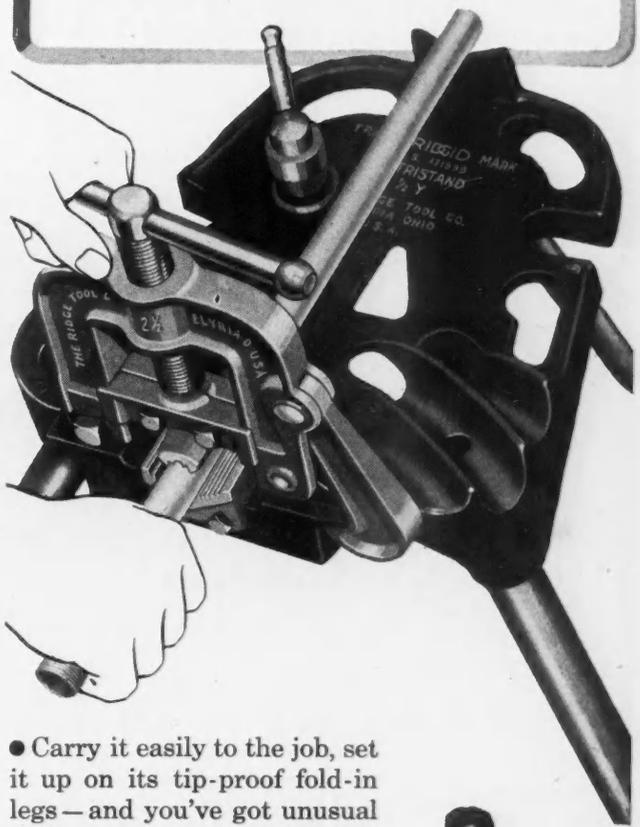

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☆ New Mexico

Drinkard Field, Lea County, Is Defined on North Side

Drinkard field defined to the north; second deep failure pending in Dublin area; northeast outpost for Paddock field is structurally low.

Lea County: The Texas Company's Bliebry 4, C SE SW 20-22s-38e, north outpost for the Drinkard field, failed to reach the Ordovician due to entering granite and was abandoned at 8377 feet.

Repollo Oil Company's Simmons 1, C SW SE 25-21s-37e, 1⅓ miles northeast of the Paddock field, logged negligible shows in drilling the Glorietta to 5325 feet, and a drill-stem test was pending. It is checking low.

Amerada Petroleum Corporation's Hare 2, deepened Permian producer and 1¾ miles north of nearest Glorietta production in the Penrose-Skelly field, logged nominal oil stains at 5670-85 feet, and was drilling at 6035 feet. This well indicated production from the 5200-foot Glorietta, and will test the Yeso before setting pipe for production test.

Dublin Field: Humble Oil & Refining Company's State-Leonard 1-B, ½ mile north of its 11,900-foot Ellenburger discovery, had not reached the Ellenburger in drilling at 12,315 feet in Shale. The company's second test for the area and ⅔ mile southeast of the discovery, also checked low and was abandoned at 9861 feet.

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Humble Announces Production Department Personnel Changes

Humble Oil & Refining Company has announced changes in supervisory personnel of the production department.

In the Mt. Sylvan District, Grand Saline, Texas, V. O. Harris will be district superintendent. He was formerly Talco district superintendent. Charles S. Yust has been transferred from the East Texas division office at Tyler, Texas, and promoted to district petroleum engineer. Charles M. Sherfesee also has been transferred from the East Texas division and promoted to district civil engineer. K. O. France, formerly district chief clerk of the London District at Overton, Texas, was made district chief clerk.

G. N. Anderson, assistant district superintendent of the Talco division, Talco, Texas, is now district superintendent, replacing V. O. Harris.

James H. Galloway, Scott and Hopper district superintendent, at Encino, Texas, is superintendent in the Means district, Florey, Texas.

The East Texas division office has added R. L. Pinion, Jr., to the staff as office civil engineer. He has been district civil engineer in the Galveston Bay district at Dickinson, and will be replaced there by E. T. Shahan, who has been transferred from the East Texas division. Monroe R. Wolters has been promoted from office civil engineer to assistant division civil engineer in the East Texas office.

Two of the East Texas personnel have been transferred, John G. Calvert to the London district office at Overton as district petroleum engineer; and J. B. Alexander to the Southwest Texas division as division civil engineer, where he will replace J. M. Carter, who is resigning.

Tom E. Beaird, London district petroleum engineer, has gone to the Hawkins district, at Hawkins, Texas. Harry R. Barkley has been transferred from the Southwest Texas division office at Corpus Christi to the Kelsey district at Santa Elena, Texas, and promoted to district chief clerk.

Philips E. Kay has resumed his duties as district chief clerk at the Conroe Gas Plant, Conroe, Texas, after a discharge from the armed forces. He was employed by Humble from 1936 to 1942, when he entered military service. S. L. Box, district chief clerk, was transferred from the Conroe plant to the Amelia Compressor Plant Construction office.

T. H. Daniels also returned from the service and resumed his position as assistant district chief clerk in the Goose Creek district, Pelly, Texas.

Everett C. Clark, Jr., civil engineer, is now district civil engineer in the Lovell Lake district, Beaumont, Texas.

Alabama-Texas Map

The Geological Survey has issued a new chart showing correlations of the Upper Cretaceous formations in Alabama and Texas, from which much of the oil comes that is found in the Gulf Coastal Plain region.

The chart, which supersedes such correlations issued in the past, covers six areas spaced at intervals across the state of Alabama and two areas in northwest Texas, has been published as Chart 23 of the Oil and Gas Investigations series. Copies may be purchased at 20 cents each from the Survey's Washington offices.

☆ West Texas

TXL Extension Completes from Ellenburger to Maintain Lease

Two-mile extension to TXL field completing from 85 feet of Ellenburger to perpetuate lease; 2 new tests starting near pending Clear Fork discovery in Andrews County; apex of Ellenburger high in Todd area shifted southeast for important completion.

Ector County: The Texas Company's T. P. Land Trust-Fraser 1-F, 2 miles north of the TXL multi-pay field, flowed 301 barrels of 43-gravity oil, with gas-oil ratio 1110/1, on 4-hour open tubing test. This production is from perforations at 9750-86 feet and open hole from 9786 to 9835 feet in Ellenburger topped at 9750 feet (revised measurement). It is calculated to be 50 feet or more above the water table. This outpost required production by July 18 to forestall expiration of the 160-acre site. The development of the intermediate area for a width exceeding 1 mile will be advanced as fast as pipe is made available. A minimum of 30 locations, as previously reported, are virtually proved by this outpost.

Phillips Petroleum Company et al's Edison-Scharbauer Unit 1, worked-over Ellenburger discovery for the Penwell field, developed water again from perforations at 8895-8910 feet. The well was flowing 9 barrels of fluid hourly, averaging 40 percent water. No water was present when this higher zone of perforations was tested. E. E. Fogelson and Cosden Petroleum Corporation's University 1-C-D, Ellenburger project 1⅞ miles southeast, tested sulphur water at 5464-5570 feet in the Tubb, topped at 5120 feet, and was drilling at 5720 feet.

Andrews County: Texas' University 1-P, C SW NW Sect. 15, Block 12, indicated oil discovery from the Clear Fork (Fullerton) sandy-lime at 7127-7269 feet, reached the water level in deepening. A drill-stem test at 7270-7320 feet yielded gas to surface in 10 minutes. The recovery consisted of 180 feet of rotary mud; 180 feet of oil and gas-cut mud, and 1170 feet of salt water. A third test was pending at 7717 feet. This wildcat correlates 106 feet high to an Ellenburger failure 1-1/16 miles northwest, according to revised correlation of electrical formation surveys. The Atlantic Refining Company is starting University Texu 1-C, 1½ miles northeast, while The Superior Oil Company's University 3 A-12 will be drilled 1 mile south of the strike.

Dollar Hide: Magnolia Petroleum Company's Cowden 1-B, ¾ mile northeast outpost and a failure in the Devonian, although structurally high, was abandoned after showing water at 8769 feet in the Silurian, topped at 8450 feet. This outpost was slated to explore the Ellenburger, but was placed on the inactive list due to the hole being from 8 to 10 degrees off vertical.

Winkler County: Cities Service Oil Company's Wheeler 1, ¼ mile north of the most northeasterly producer in the Wheeler field, entered the Devonian at 8365 feet, or 49 feet low, and was drilling at 8475 feet after showing for a producer. A drill-stem test at 8460 feet yielded gas to the surface within 16 minutes for a rated flow of ½ million cubic feet daily. The recovery consisted of 830

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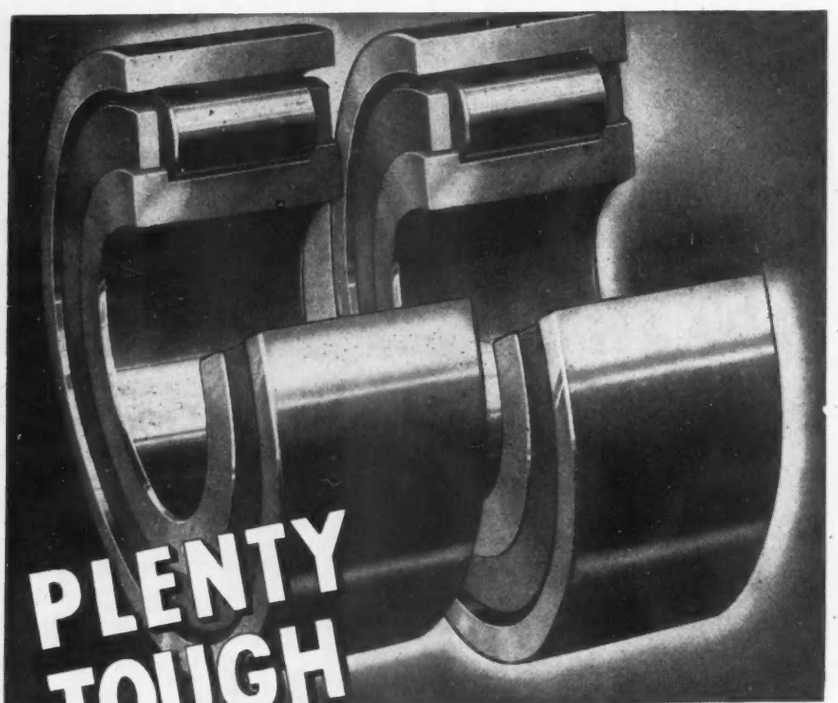
feet of oil cut with mud and 200 feet of clean oil. It offsets the highest Devonian well, which was completed from 56 feet of Ellenburger perforations. Phillips Petroleum Company's T. P. Land Trust 1-G, ½ mile east outpost and in Ector County, passed up nominal oil and gas show in the 7800-foot Basal Permian, and was drilling lime at 8210 feet. It correlates slightly lower on the Permian markers, indicating flattening of the structure to the east. Stanolind Oil & Gas Company-Shell Oil Company's Wheeler 1-B, Ellenburger producer on the southeast edge of the field, flowed 608 barrels of 36-gravity oil initial through 12/64-inch choke after using acid through Devonian perforations at 8425-75 feet for dual completion.

Keystone Field: Amon G. Carter and The Pure Oil Company's Walton 2-E, completed June 14, 1943, as the Ellenburger discovery from open hole at 9542-9655 feet, flowed 732 barrels of 43-gravity oil, with gas-oil ratio of 1142/1, through ¼-inch choke after deepening to correct excessive gas-oil ratio penalty. It was originally completed at 438 feet in the Ellenburger, with the top 307-foot section classed as the gas-distillate zone. Deepening established the presence of a 727-foot section of broken Ellenburger pay followed by granite wash at 9944 feet, and the well is bottomed in granite at 10,022 feet. The hole was plugged back to 10,000, although no water was encountered. Inability of some operators to obtain pipe has curtailed Ellenburger development to 23 drilling and 2 wells in process of completion. The field will soon have 100 producers in this zone, and each will average above 1 million barrels in crude output, while the condensate yield thereafter from the gas-cap will be substantial. Cased off flowing production from the Devonian, Sulurian and Simpson zones may remain undisturbed, except beyond the Ellenburger productive area, for a decade or more.

Deep Explorations: Argo Oil Corporation's Roberts 1, Reeves County wildcat that passed up nominal oil flow from Basal Permian, was drilling dry sand and shale at 11,485 feet. In Hockley County, Humble Oil & Refining Company's Campbell 1, a mile south of the Anton field, was abandoneod in dry lime at 11,730 feet. Cities Service's Parker-Wentx 1, near Harper field, Ector County, was drilling at 12,010 feet in Simpson, topped at 11,695 feet, while Stanolind's Kayser Unit 1, near Foster area, resumed drilling at 12,067 feet in Silurian, topped at 12,009 feet, after recovering drill pipe.

Crockett County: Francis A. Caller et al's Todd 1, C NW NW GC&SF Ry. 66, extended the Todd-Ellenburger field 4100 feet southeast with the second largest field potential in flowing 3168 barrels of 42.6-gravity sweet oil, with gas-oil ratio 540/1, through ¼-inch choke after using 5000 gallons of acid. This outpost occupies the highest structural position, having entered the Ellenburger at 5790 feet, with elevation of 2691 feet, and pipe was landed at 5900 feet for completion from open hole to 6092 feet. A structurally-low Ordovician failure is 1¼ miles southeast, otherwise the limits of production to the east and southeast are open for major expansion.



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RMOG Quarterly Meet

The quarterly meeting of the Board of Directors of the Rocky Mountain Oil and Gas Association will be held June 27-29 at the Canyon Hotel, Yellowstone Park, Wyo., H. O. "Tex" English, executive secretary, has announced. Hotel reservations should be made immediately with the association's offices, 628 West Yellowstone, Casper, Wyo.

The association's annual meeting is scheduled November 21-23, Shirley-Savoy Hotel, Denver.

☆ North Texas

Jack County Wildcat Shows for Gas Well from Bend Series

Jack County wildcat showing for gasser from the Bend series; official gauge given Wilbarger County discovery; drilling contractor starting 9 wildcat and semi-wildcat shallow tests in Archer County.

Jack County: Continental Oil Company's Heath 1, C. A. Beatty Survey A-1358, and 7/16 mile southwest of the Webb 2900-foot 1-well pool, registered 1150 pounds casing pressure after swabbing down. It is a gasser from thin pay in the Bend, topped at 4432 feet, and the gas was not considered of commercial value until the well unloaded while concluding a test of the barren Ellenburger at 6020-6414 feet. The hole was then plugged back to 4460 feet to set pipe at 4432 feet. Continental's Durham-Kempner 1, Chas. J. O'Conner Survey and 3¾ miles southeast of Cundiff, was drilling at 5860 feet on Ellenburger contract after passing up gas showings in

the basal part of the Bend, topped at 5028 feet.

Wilbarger County: National Associated Petroleum Company's Schmoker 1, C N½ NW NE H&TC Ry. 111, Block 14, and 2½ miles north of shallow production, flowed 323 barrels of 36.5-gravit oil natural through ½-inch choke from Canyon open hole at 3514-27 feet. This wildcat made an unsuccessful exploration of the Ellenburger at 5693-5718 feet.

Cooke County: Sun Oil Company and The Texas Company's Gibson Unit 1, John Massingill Survey and near the north edge of the Sivels Bend field, scored the second producer from the Dillard (Basal Strawn) sand in flowing 85½ barrels of 36.6-gravity oil on 6-hour natural test through ⅜-inch choke from open hole at 7368-78 feet. Mid-Continent Petroleum Corporation's Field 1, F. Wilkerson Survey and 3600 feet west of production, swabbed 137 barrels of oil and 18 barrels of bottom sediment and water on 35-hour test from perforations at 6710-18 feet. A small pumper is assured. However, production has been extended 8600 feet west into Love County, Okla., by a pumper in the 6100-foot sand. Magnolia Petroleum Company's Bush 2, J. McKerley Survey, flowed 249 barrels of 39.8-gravity oil, with gas-oil ratio of 686/1, on natural test through ¼-inch choke from perforations at 6671-89 feet. They pay is thicker and higher structurally than the discovery in this zone.

Grayson County: Standard Oil Company of Texas' Mitchell 1, projected Ellenburger test for the Sherman geophysical prospect, was drilling sand and shale at 8915 feet. A drill-stem test at 8177-8665 feet yielded 1390 feet of gas-cut mud, but bottom-hole pressure was subnormal, having built up to 1100 pounds in 10 minutes. The company is rigging up a second test to explore numerous Strawn showings passed up by Mitchell 1.

Archer County: Reno Oil Company and Continental have united their shallow properties in the Oldham field, centering upon the Eliza Hubble and Sect. 2, S.P. Ry., A-1281, surveys to install a water-flooding project. Reno owns 40 percent of the pooled leases, which are pumping 62 barrels daily from 23 wells, and will operate. Locations have been made for the drilling of 12 new 1400-foot tests, including input wells.

Harvey Drilling Company, Wichita Falls, has been given permits to drill 9 wildcat and semi-wildcat 1600-foot tests on as many 160-acre sites situated to the north, west and south of the Oldham pool. Eight are on the Abercrombie-Taylor ranch, and 1 is on the Key land.

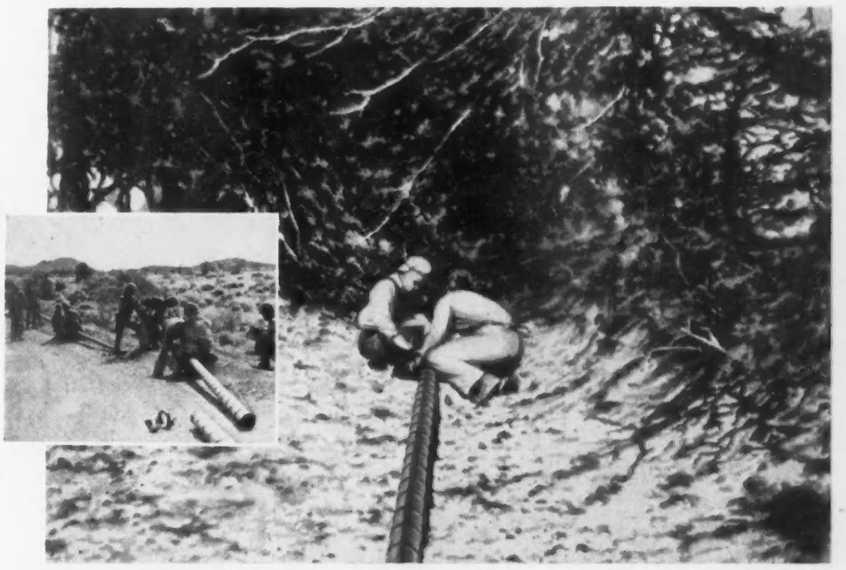
☆ East Texas

Cherokee County Deep Prospect Is Drilling in Dry Rodessa

Cherokee County deep prospect reaches dry Rodessa; Anderson County wildcat junked; 5 wells slated for the Tri-Cities deep field, Henderson County.

Cherokee County: Hunt Oil Company's Andrews-Pure 1, Jacksonville prospect, was drilling upper Rodessa without shows at 8790 feet. This wildcat logged base of the massive anhydrite at 7825 feet with elevation of 497 feet. Tom

HOW TO CUT LAYING COSTS IN HALF ON FIELD GATHERING LINES



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Shaw et al's Tilley 1, Chas. Widgeon Survey and near a wildcat pumper completed last March, was awaiting orders in water sand at 4237 feet. The Woodbine sand was entered at 4188 feet, with elevation of 302 feet, and the first 2 feet showed possible oil and gas production, but this was followed by water sand.

Anderson County: Humble Oil & Refining Company's Freeman 1, Brushy Creek prospect, recovered part of the stuck drill-pipe after an extended fishing job, and was ordered junked at 12,686 feet.

Henderson County: W. B. Hinton et al are rigging up for a test in the southeast corner of the Spurlock 482-acre tract, Joseph Rice Survey, Tri-Cities field. Five tests are proposed. This field has been dormant for some time, although it has 5 wet gassers and a high-gravity oil producer, all from the Rodessa. The oil producer is averaging 5000 barrels monthly after being on production since 1941.

Lone Star Producing Company's Dyer 1, Adrian Anglin Survey and third try for oil production on the north flank of the Opelika field, showed a small amount of oil and gas when tester was used in the Rodessa at 8744-59 and 8825-49 feet, and was drilling at 9210 feet. It will test the Pettit for gas, then plug back for completion try in the Rodessa.

Hunt County: McHenry et al's Neely-Magnolia 1, J. E. Clark Survey and 3 miles southeast of Caddo Mills, entered the massive anhydrite near the 4660-foot level, and was fishing for drill-pipe at 8685 feet.

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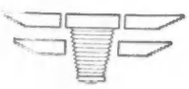

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☆ South Central Texas

Muil Field's Initial Oil Well Gauges 64.8 Barrels on Test

Potential gauged on first oil well in Muil field; wildcat near Friotown abandoned; operators plan new test nearby; Dimmitt County oil discovery tested on pump.

Atascosa County: Quintana Petroleum Company's Muil 2, first oil well in the Muil field, gauged production at 64.8 barrels of 42.6-gravity oil with no water during potential test. Test was through ¼-inch choke with gas-oil ratio of 15,000/1, tubing pressure 1000 pounds, and casing pressure 1400 pounds. Production is from perforations at 8996-9005 feet in the Edwards lime, topped at 8970 feet. The well is 1320 feet southwest of the No. 1 gas-condensate discovery.

Frio County: George Strake & Warren Petroleum Corporation's Henry 1, wildcat 3 miles northeast of Frio, has been abandoned at 3669 feet. A drill-stem test in the Edwards lime at 3601-14 feet recovered 270 feet of fresh water in 30 minutes. Located 3750 feet from the NW line and 5250 feet from the NE line of A. Petra de la Pena Survey 153, the Henry 1 is said to have run very low. Operators are reported planning another well in the area and are holding the rig at its present location pending arrangements for the new test.

Dimmitt County: Humble Oil & Refining Company's Mrs. Kate Bradshaw 1, oil discovery at Carrizo Park, gauged production on pump at 30.25 barrels of 37.7-gravity oil daily, 3 percent being salt water. Production is from perforations at 2795-2807 feet and total depth is 2965 feet. This well is about 2 miles southwest of Carrizo Springs and east of the Davis 1 gas discovery completed in this area last year.

Leasing and Geophysical Work Points to Tennessee Tests

A revival in leasing interests along a well-defined ridge in an area from Memphis northeast toward Reel Foot Lake, Tennessee, appears evident with increasing activity of various geophysical crews.

In Maury County, the Western Geophysical Company, subsidiary of Stanolind Oil & Gas Company, is reported doing considerable gravity work for Stanolind. Another geophysical crew for The Pure Oil Company also is active in the area.

Activity reported by counties includes:

Clay: Near Red Boing Springs, in the western portion of the county, W. O. Allen, Tulsa operator, is reported drilling below 1500 feet on Jenkins 1. Knox Dolomite was topped at 1386 feet.

Stewart: Berry & Skirvin, Oklahoma City, have three blocks of land, comprising 14,000 acres, and it has been reported the partners are leasing another area. It is reported that five tests will soon begin on these holdings.

Fayette: The Americrude Oil Company, Grand Rapids, Mich., purchased three blocks.

Franklin: Harry Carter, Tyler and San Antonio, Texas, has acquired a 50,000-acre block.

Haywood: J. P. Pierce, Elizabethtown, Ky., has accumulated a 10,000-acre concentration, and a test is expected shortly.

☆ Southwest Texas

Aviators Area Test Sets Pipe; Sejita Field Well Completed

Casing set in Aviators area wildcat; Sejita field well completed; tests start at Ross pool south outpost.

Webb County: Dulaney Oil Company's State of Texas 3, wildcat in the Aviators field area, logged broken sand with oil show at 1501-56 feet and has 5½-inch casing set to 1501 feet for production test. Drilled to total depth of 1560 feet, this test is the third consecutive wildcat in the same tract. It is 330 feet from the SW line and 330 feet from the southerly NL of State Survey 838. It is 556 feet NW of the State 2 dry hole, which was 330 feet NW of the State 1, both of which had shows and failed on production tests.

Duval County: R. C. Lipscomb has completed Salinas 3, Sejita field, for 127 barrels of 43-gravity oil daily, no water, from perforations at 5791-5803 feet. Flow was through ⅛-inch choke with gas-oil ratio 620/1, tubing pressure 800 pounds, and casing pressure 450 pounds.

Starr County: Houser & Campbell et al's Semmes 1, south outpost in the Ross field, has 5½-inch casing set on top of the 2300-foot pay sand after drilling and coring to total depth of 2386 feet. Tests were to begin after cement had set. This well is 1393 feet south of W. D. Kennard's Semmes 1, previous south extension well, and is in NW corner of a 1260-acre lease, Porcion 88.

Sgt. York Has Well

Sgt. Alvin C. York has completed a 200-barrel well near Byrdstown, Tenn. York, World War I hero, has started a second well.

☆ Lower Texas Coast

East Mauritz Field's Third Oil Producer Finaled by Sterling

Third oil producer for East Mauritz field finaled; Live Oak County wildcat sprays oil; increase in Sheriff field allowable sought; East Placedo gets new gas well.

Jackson County: Sterling Oil & Refining Corporation's Kountze & Stewart 1-B, recently completed as a northwest extension to the East Mauritz field, is the third oil producer for the field. The well is ½ mile northwest of gas production and 4000 feet northwest of oil production. Kountze & Stewart 1-B flowed 94.5 barrels of 27.8-gravity oil daily through ⅛-inch choke on potential test and had gas-oil ration of 475/1. Production is from perforations at 5624-46 feet and total depth is 7920 feet with 5½-inch casing set to 6827 feet. This well produces from the same sand zone as the other 2 oil producers for the field.

Live Oak County: Stanolind Oil & Gas Company's Reagan 1, wildcat in the Jas. McGloin Survey 3-26, Oakville field area, sprayed oil when pulling drill stem following a drill-stem test at 6731-35 feet in the Wilcox zone. Operators are expected to drill deeper before casing is set and tests made for production. Previous drill-stem tests at 6717-25 and

Fig. 102 (Front)—Acme Wire Line Clamp—12" liners. Only 10 parts—160 lbs. 200-ton breaking load. 6 to 1 safety factor. Perfectly balanced, for 1 man hitch-on, SAFELY. Patented non-fouling SAFETY link. Recommended for 3000' wells.

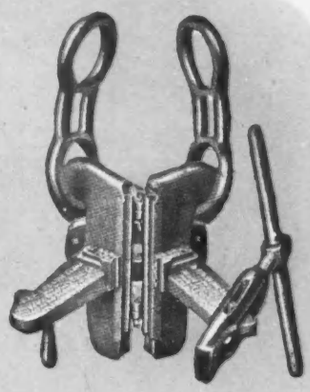

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FIG. 102

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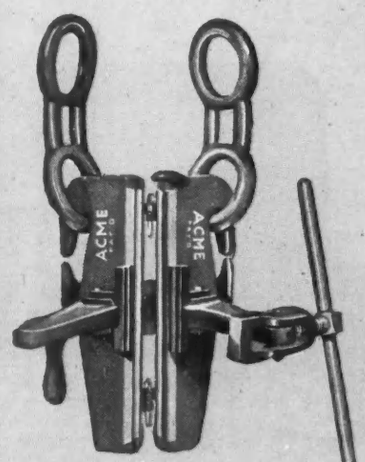

Fig. 103 (Front) — Acme 18" Safety Wire Line Drilling Clamp. For wells deeper than 3000'. Same exclusive features as 12" clamp — for safe "super-service" — but with 50% more gripping surface. Weighs only 173 lbs. but a GIANT in action.

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6725-31 feet showed gas and condensate.

Calhoun County: Quintana Petroleum Company has requested that the Texas Railroad Commission increase the allowable for the Sheriff field. The only operator in the field, Quintana has completed 7 producing wells, all producing 37.3-gravity oil from the Greta zone. The applicant contends that a larger allowable is necessary so that the wells will produce within the 2000/1 gas-oil ratio limit. Quintana asks a permanent 75-barrel daily allowable for wells in the field.

Victoria County: Stanolind Oil & Gas Company's Vandenberge & Hill 18, 3305 feet northeast of the No. 1 well in the East Placedo field, has been completed as a gas well. With no potential taken, the well had shut-in pressure of 2510 pounds from perforations at 6420-24 feet. Total depth is 7524 feet with 5½-inch casing set to 6938 feet. Previous tests failed in perforations at 6880-83, 6065-75, and 5675-80 feet and 4822-24 and 4814-18 feet.

Personnel Changes in Three Pure Divisions Are Announced

The Pure Oil Company has announced changes in the producing divisions of the Illinois, Rocky Mountain and Texas territories. H. C. O. Clarke, superintendent of the Rocky Mountain division for several years, a veteran of 22 years' service with the company, will become manager of the Illinois producing division, with headquarters at Olney. R. W. McIlvain, Jr., head of the Texas division, will become manager at the Rocky Mountain headquarters in Billings, Mont. Raymond B. Kelly, who has been Illinois division manager for six years, will become manager of the Texas headquarters at Fort Worth. Kelly has also been with the company for 22 years.

C. M. Harden, division superintendent at Olney for the Illinois producing division, will have similar duties in the Rocky Mountain territory. He will be replaced by H. L. Donhaiser, division superintendent at Saginaw. Guy J. Anderson, former district superintendent at Reed City, Mich., replaces Donhaiser.

☆ Upper Texas Coast

Pan American Sets Protection String in Liverpool Wildcat

Protection pipe set in Liverpool area wildcat; Needville area wildcat abandoned; second Hackberry attempt in Northwest Hamshire area tests gas; Midfields pool extended 3000 feet southwest; Sugar Valley east side producer has 86 million cubic feet on open flow potential.

Brazoria County: Pan American Production Company has set 7-inch protection string in Callihan 1, wildcat 1½ miles southeast of Liverpool townsite and just across the bayou from Chocolate Bayou production. An electric log run to 11,602 feet indicated some shows near the bottom and after drilling to 11,618 feet it was decided to set protection pipe, now cemented to 11,615 feet. Scheduled total depth is 12,000 feet. This wildcat is 4650 feet west of Stanolind Oil & Gas Company's Houston Farms 1-B, which extended Chocolate Bayou production of gas and condensate.

Fort Bend County: W. L. Goldston's

Roesler 1, wildcat 1¾ miles northeast of production in the Needville field, F. Forster Survey of Sect. 40, is a dry hole.

Jefferson County: In the Northwest Hamshire area, McCarthy Oil & Gas Corporation's W. C. Tyrrell Trust 4 flowed dry gas on initial test of the Hackberry sands at 10,238-252 feet. This test is 900 feet west-northwest of the No. 3 discovery well completed February 14 for 217 barrels of 39-gravity oil from perforations at 10,161-169 feet. The No. 4 well, running lower than No. 3, has 5½-inch casing set to 10,428 feet and total depth of 10,563 feet.

Matagorda County: In the new Midfields field, Sun Oil Company's Spur and Trull 1, I&GN Survey 4, Block 6, has extended production 3000 feet southwest. On potential the well flowed 194 barrels of oil daily through 7/64-inch choke with 2550 pounds flowing pressure on tubing, and gas-oil ratio 1500/1. Total depth is 9158 feet with 5½-inch pipe cemented on bottom and perforated at 9136-38 feet for completion.

On the east side of production at Sugar Valley in Matagorda County, Skelly Oil Company's Cocke 1 flowed 86 million cubic feet of gas daily on open flow potential from a new gas producing sand. Through 3/16-inch choke the well gauged 2,302,000 cubic feet of gas daily with 22.68 barrels of 48.9-gravity condensate and 2900 pounds flowing pressure on the tubing and shut in pressure of 2950 pounds. Casing was set to 8388 feet and perforated for completion at 7674-78 feet, with total depth 8400 feet.

☆ South Louisiana

Avoyelles Parish Wildcat Has Show in Neal Sand of Wilcox

Avoyelles Parish wildcat has oil show in Neal sand of Wilcox; at north extension area of New Iberia field Humble completing well in new pay sand; confirmation test in Little Temple area of LaFourche Parish abandoned; second oil well completed in Caillou Island deep production zone.

Avoyelles Parish: Avoyelles Petroleum Company's Bordeleon 1, wildcat 20 miles northeast of Eola in 56-2n-4e, is testing a good show of oil in the Neal sand of the Wilcox at 7931-49 feet. Total depth is 9012 feet with 5½-inch casing set to 7990 feet. Formation tops by electric log are Vicksburg, 3329 feet; Sparta lime, 4409 feet; basal Cane River marl, 5492; and Wilcox, 5542.

Iberia Parish: Humble Oil & Refining Company is recompleting Mrs. C. W. Germany et al 2, north extension area of New Iberia field, in a new oil pay horizon for the area. Previously, casing had been perforated at 10,087-101 feet and flowed 1,600,000 cubic feet of gas daily through ¼-inch choke with 30 barrels of 44-gravity condensate. These perforations were squeezed and casing reperforated from 9905-16 feet, and on initial test flow was gauged at 308 barrels of 33.6-gravity oil daily with 1375 pounds pressure on the tubing and gas-oil ratio of 552/1. Total depth is 10,196 feet with 5½-inch casing set to 10,157 feet.

LaFourche Parish: Humble's Louisiana Delta Farms 2, confirmation test in the Little Temple area, 19-17s-23e, has been abandoned as a dry hole after drilling to 10,726 feet. This well is ½ mile northeast of the No. 1 discovery well that flowed 69 barrels of fluid, 75 percent water, from a broken sand at 10,585-635 feet.

Terrebonne Parish: The Texas Company's State-Caillou Island 80, on state lease 188 in the Caillou Island field, has been completed as the second oil well in the deep production zone. On potential the well flowed 374 barrels of 37.3-gravity oil per day through 10/64-inch choke with 2460 pounds pressure on tubing. With 7-inch pipe cemented on bottom at 11,875 feet, perforations for production were made from 11,822-854 feet. In this well the producing sand is approximately 35 to 40 feet lower than the deepest producer in the field.

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☆ North Louisiana

Wildcats in Richland, DeSoto Parishes Have Slight Shows

Wildcats in Richland and DeSoto parishes have slight gas shows; deep tests in Jackson, Union and Sabine parishes progressing; Boosier wildcat to go into Smackover.

Richland Parish: Robert Sellars' wildcat, Thomas Burke 1, SE SW 4-16n-7e, tested a small volume of gas, no oil, from perforations at 2612-16 feet. The well missed the gas rock and topped Tuscaloosa at 2485 feet; going to total depth of 3318 feet. Sand showing gas at 3040-70 feet has not been tested.

Two new wildcats continued to maintain the parish's record for activity. Lion Oil Company staked Williams 1, 1894 feet west and 660 feet north of SEc 8-14-5e. Roy L. Fisher staked Cooper 1, 1330 feet north and 330 feet east of SWc NW SE 21-17-7e

DeSoto Parish: Kerr-McGee Oil Industries is drilling in the Lower Glenrose, below 5631 feet, without commercial showings in Nabors 1, C SW SE 28-12n-14w. A drill-stem test at 5089-5104 feet recovered gas-cut mud.

Bossier Parish: Barnsdall Oil Company's Carter Burton 1, wildcat, 26-23-13w, Plain Dealing area, which for several days has claimed special attention, was reported changing pumps after drilling to 10,851 feet. A 3-foot core from 10,799-802 feet, with 2-foot recovery, showed only hard tight sand. Operator will continue testing deep into the Smackover, which it is hoped will connect with deep pay in Claiborne Parish.

Sabine Parish: Union Producing Company's Louisiana Long Leaf Lumber Company 1, 29-8-11w, north of the Zwolle field, is drilling below 10,890 feet in shale and lime.

Jackson Parish: Shell Oil Company's Tremont Lbr. Co. 3, in 21-15-1w, is coring below 10,044 feet, with no report of findings.

Union County: Union Producing Company's deep test in Big Island field, Belgard 1, NW 14-4n-3e, was preparing to retest at plugged-back depth of 10,059 feet. Total depth is 12,001 feet.

Lincoln Parish: The California Company's T. L. James & Company 1, 31-20n-3e, Hico-Knowles area, is reported to have cored and tested a 60-foot sand section in the Bodcaw zone of the Cotton Valley. The well, at total depth of 8571 feet, is running 230 feet higher on structure than the discovery well 2¾ miles south and 1 mile west of the prospective new producer.

Madison Parish: Rogers Lacey et al set 10-inch casing in Bryant 1, 28-17-10e, a wildcat.

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☆ Arkansas

Village Field Receives Initial Production from Cotton Valley

Village field gets first Cotton Valley production; Wesson field, Ouachita County, has ¼-mile extension; 2 wildcats fail.

Columbia County: E. G. Bradham's Tena Crumpler 1, C NW NW 15-17s-19w, has completed as the first oil well in the Village field from the Cotton Valley sand. Producing at the rate of 200 barrels per day of 49-gravity oil through ⅛-inch choke, the well fulfills expectations since the field's discovery well logged showings of oil in both Cotton Valley and Travis Peak. All previous production, however, has been from the Smackover. The hole was perforated with 8 shots from 5567-74. Prior to this production test the well had been perforated with 24 shots from 7384-94 and 7410-13 feet and had recovered 26 stands of oil and 10 stands of salt water, after which squeeze job was made.

Ouachita County: McAlester Fuel Oil Company's C. M. Wesson E-1, SE NW NW 24-15-19, giving a ¼-mile northwest extension to the Wesson field, was completed, casing having been perforated at 3428-3434 feet, in the Travis Peak sand. The well, gauge not reported yet, is believed one of the best producers in this field.

Jack Garnes' Myars Estate 1, wildcat, NE NE SE 24-13-19, was abandoned as dry. Joe Mucher's Berg Estate 1, wildcat, in NW SE NE 12-14-18, also was abandoned.

Dred County: C. A. Kinard's McCauley 1, C NE SW 14-12s-6w, wildcat 6 miles east and 3 miles north of Monticello, in the Desha Basin, was perforated from 3696-3702 feet, where sidewall cores indicated gas. The well flowed salt water on drill-stem test without showings of oil or gas. The well, bottomed at 5057 feet, is waiting on orders, but may be squeezed and another test run. Unofficial report states that the well

logged 200 feet of sand. It is also reported that Kinard will start another wildcat in 22-13s-6w, 7 miles south of McCauley 1.

Nevada County: Charles F. Steele's H. A. Waters 1, NW NE 20-14-21, after perforations were made between 1207-19 feet, and casing ripped in 32 places, netted 5 barrels of oil, and after casing was again ripped between 1207-1231 feet, the wildcat flowed an estimated 150 barrels of fluid, including 30 barrels of oil, the balance water.

Little River County: R. W. O-Meara et al's wildcat Ed Wood Heirs 1, 7-14s-28w, spudded and set surface casing. The well will be watched with interest, location having been selected on basis of both seismic work and sub-surface geology.

Heidelberg Field Reservoir Pressure Registers Decline

Reservoir pressure in the Heidelberg field, which ranks among the important crude reserves in Mississippi, is showing a sharp decline, according to engineers' survey, since the allowable production per well was boosted from 75 to 150 barrels daily.

The field is credited with having produced 15,350 barrels daily from 116 wells during the first week in June. Bottomhole pressure registered an average decline of 25 pounds during May, while the normal decline under the 75-barrel per well allowable averaged about 25 pounds every three months. The allowable hike has been reflected by a sharp boost in percentage of water produced by edge wells. This field was expected to yield about 600 barrels of crude per acre foot of pay, but this figure has been lowered in view of the receding pressure.

☆ Mississippi

Small Fields Are More Active; Tests Staked by Independents

Activity in smaller fields picks up; independents active in staking locations; 5 abandonments recorded.

Lincoln County: Roeser & Pendleton's W. Lonnie Case 1, NE SE 8-7n-7e, Brookhaven field, has been successfully completed for one of the best producers to date. Lower Tuscaloosa was perforated at 10,212-266 feet with 324 shots and on initial production test the well flowed 1048 barrels of 38.4-gravity oil through 5/16-inch choke. Four other wells are also drilling in the field.

The California Company's Mary-Parnell-McDaniel 1, NEc SE 17-6n-8e, wildcat, is drilling below 4112 feet in a test of the Lower Tuscaloosa at 10,000 feet. Roeser & Pendleton's Columbus Lumber Company 1, NE NW 20-6n-6e, wildcat, is below 2100 feet and Humble Oil & Refining Company's Lincoln County Board of Supervisors 1, NEc 16-8n-5e, is preparing to set up derrick for a test of the Lower Tuscaloosa.

Claiborne County: Sun Oil Company's W. R. Hammett 3, 15-11n-1e, Bruinsburg gas field, is preparing to test shows encountered at 1590 feet. A drill-stem test at 1355-1410 feet recovered mud and salt water slightly cut with gas.

Sharkey County: J. H. Gwin's Rice 1, SW SW SW 14-11n-7w, Cary field, which has been held up for some time by high water, is working on stuck drill stem at 3208 feet. No shows have been reported up to that point. V. V. Ryan has completed roads for Houston Estate 1, SW SW 32-11n-6w, wildcat.

Adams County: Humble's Adams County Board of Supervisors 1, SEc 47-6n-1w, is continuing with core tests below 10,091 feet after tests just above that point recovered shale with no shows. In the Cranfield field Gulf Refining Company's Ella G. Lees 4, NEc 71-7n-1w, has been completed from perforations opposite the Massive sand zone at 10,308-13 feet. Initial production was 305 barrels of 38.9-gravity oil with gas-oil ratio 1011/1. California's Ella Lees 16, 47-7n-1w, Cranfield, has also been completed with an initial production of 110 barrels per day through ⅛-inch tubing choke.

Forrest County: The Superior Oil Company's Cassie Bradford 1, deep test in SEc SW NW 1-3n-13w, is drilling below 9113 feet with no shows.

Yazoo County: Southern Natural Gas Company's Gammill Investment Company 2, SE SW NE 6-9n-4w, wildcat, has been abandoned in the Comanchean horizon at 7649 feet. Shows of heavy oil were indicated in the Eutaw at 6500-6600 feet but drill-stem tests failed to develop commercial possibilities. In the Tinsley field Union Producing Company's Jennie Stevens 23, NEc 12-10n-3w, is drilling below 4532 feet in shale for the only active operation in the area.

Marion County: Humble's E. A. Ball 3, NWc 20-2n-14e, Hub field, which is attempting to develop production from

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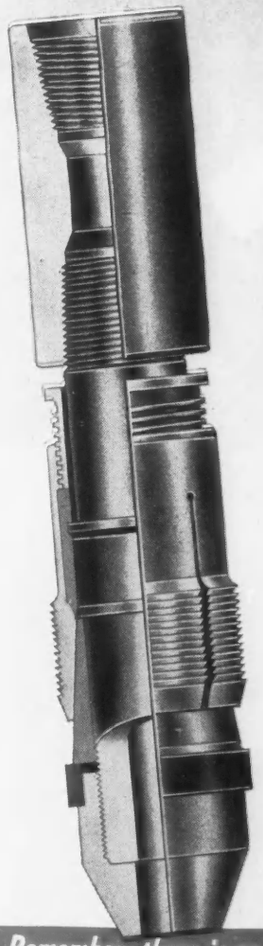

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the Comanchean zone below 9900 feet, recorded a good blow together with mud and salt water from drill-stem test with packer at 9910 feet.

Wayne County: Gulf's Lillie M. Johnston 2, SEc NE SW 34-10n-9w, only active operation in the Eucutta field, is preparing to make production tests in the Eutaw. Cores taken of the zone recovered only fair shows of heavy oil.

Jeff Davis County: Gulf's D. C. Wigington 1, NEc SE NE 19-9n-18w, Gwinville field, is testing production after the well flowed 208,000 cubic feet of gas on drill-stem test at 7985 feet. Gulf's only other active operation in the field, the Maggie L. Thompson 1, SEc NE SW 14-9n-19w, is drilling below 4712 feet.

Alabama

The Carter Oil Company's E. A. Rentz 1, NE NW NE 4-10n-3w, Choctaw County, development well in the eastern section of the Gilbertown field, is running core tests in the 4000-foot zone. No shows have been reported.

Winston County: Glen D. Rose Oil & Gas Company's First National Bank of Birmingham 3, SWc SE 7-12s-8w, wildcat, is drilling below 1902 feet with no shows.

Walker County: Glen D. Rose's First National Bank of Birmingham 2, NW SE 30-12s-7w, wildcat, is drilling below 2300 feet in Trenton. No shows have been reported.

Clarke County: Work will get under way immediately at The California Company's wildcat in C NE SE 12-7n-1w, in an area where 6 other tests have been abandoned. California's White City Plantation 1, 6-7n-1e, which was abandoned at 4009 feet last summer, is ¾ mile northeast of the new location.

Florida

Gulf Refining Company's State 2, SWc 15-67s-27e, Monroe County, is clearing location for the second test of the area upon reports that structure is favorable. Its State 1, 2-67s-29e, is working below 8785 feet with no shows. Cores from 7925-35 feet recovered lime and anhydrite.

Dixie County: Stanolind Oil & Gas Company-Sun Oil Company's Perpetual Forest 1, NW NW 5-11s-11e, is drilling below 5700 feet with no shows indicated.

Osceola County: Humble Oil & Refining Company's N. Ray Carroll 1, SE SE 10-27s-34e, is drilling at 6649 feet. No shows have been reported so far.

Hernando County: The Ohio Oil Company's Hernasco Corporation 1, NWc 19-23s-18e, is drilling below 8241 feet with no shows reported.

Hillsborough County: Humble's T. S. Jameson 1, NE NE 7-31s-22e, wildcat, is drilling below 10,010 feet. No shows are indicated.

Levy County: Sun Oil Company's J. P. Goethe 1, SWc 31-14s-17e, has been abandoned as a duster at 3985 feet in Quartzite. No shows were recorded at any point along the hole.

Collier County: Humble's Gulf Coast Realty Company 8, SW SE 19-48s-30e, Sunniland field, is drilling below 4952 feet in its drive for the 10,000-foot zone. Humble is also building roads for Lee Cypress Company 1, SW SE 28-47s-29e.

Dade County: Gulf's Model Land Company 1-C, in unsurveyed T-60s-35e, is rigging up for deep test.

Walton County: Rogers Lacy et al's Walton Land and Lumber Company 1, C SW SW 14-1n-18w, new wildcat, is at 970 feet and waiting on cement.

Roeser & Pendleton Leases Superior's Mississippi Lands

The Superior Oil Company has leased most of its holdings in the Baxterville field, Lamar County, Mississippi, to Roeser & Pendleton, Inc. According to the reports the transaction involves the transfer of 5920 acres. The acreage comprises 9½ sections making up almost a solid block in the southern half of Lamar County, which is valued up to $7 million. Superior will retain seven producers in the field and certain over-riding royalty interests on the transferred holdings, while Roeser & Pendleton agree to keep at least one drilling rig in constant operation in the section.

Sinclair-Wyoming Oil Company reportedly has farmed out 80 acres in the the Heidelberg field of Jasper County to Richard B. Lack of Jackson. The land is in the northwest end of the field on the upside of the northwest fault that passes through the field. Operations will be undertaken to determine the boundary of the field on that side.

☆ Rocky Mountain Area

Colorado and Wyoming Uinta Basin Activities Expanding

Uinta Basin activities expanding; Rangely may have new productive zone.

Colorado

The Carter Oil Company has entered the Colorado oil play with announcement that it will be the unit operator of the 15,000-acre North Craig (Cottonwood)

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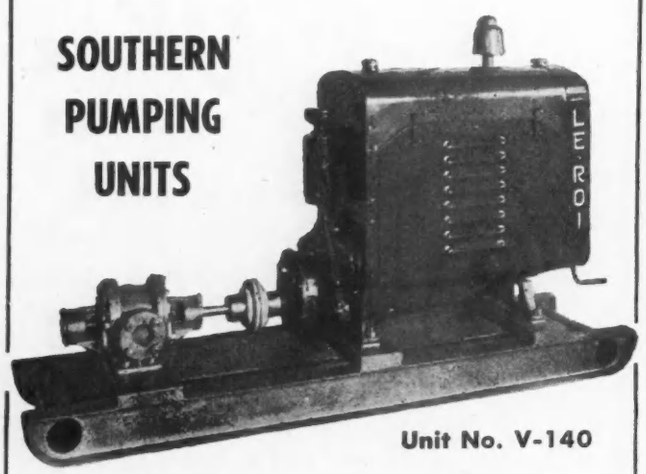

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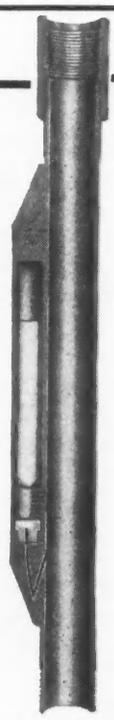

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deep test in Moffat County. First well, a test to 8000 feet if necessary, will be in 30-8n-90w and operations are scheduled to begin as soon as unitization arrangements are completed.

This will be Carter's first Colorado drilling activity, although the firm has been active for several years in acquisition of leaseholdings in northwestern and southeastern Colorado and adjoining states. The company owns important marketing facilities in the Denver area.

Another Uinta Basin operation now rigging up rotary is Union Oil Company of California's Beaver Creek deep test on the Beaver Creek structure 40 miles southeast of Craig in Routt County. Several small oil fields in this are are supplying high-gravity oil to The Texas Company's refinery at Craig.

Rangely field continues its rapid development with 5 more completions, including 3 California Company wells averaging about 400 barrels of oil per day on chokes, a Stanolind Oil & Gas Company well flowing 354 barrels per day through 20.64-inch choke, and the Wasatch-Idaho-Sharples' McLaughlin 2-28 flowing 332 barrels daily.

South of the White River in the Rangely field area the Cobb-Stringer-Newton wildcat, bottomed at 6874 feet, has been abandoned as to Lower Pennsylvanian and entire Weber section. Whether this well will be whipstocked above the Weber for directional drilling away from the fault zone or abandoned in favor of a new hole has not been determined. At 4300 feet this hole encountered brecciated fault zone and drilling continued in this faulted area to the bottom of the hole. Weber was topped at 5740 feet. Cores showed broken, shattered and faulted material including gypsum with shows of saturation. Bottom 200 feet of Weber consisted of red, broken, faulted sand. Water was encountered at 6792 feet. Particular interest has centered in a saturated zone encountered at 6820-74 feet, from which corings showed buff-colored sandstone devoid of cementing material, saturated, broken and faulted. Core analysis indicated small amount of water. Casing was run to 6816 for testing. Test showed both oil and water; water production at rate of 2½ barrels per hour; oil 31 gravity and black. Fluoroscopic color analysis showed oil considerably darker than Weber oil, which led to the report that this well, while officially listed as the first failure in the Rangely field area, opens a possible new producing horizon below the highly productive Weber sandstone. Location is Lot 14, SE SE 4-1n-102w.

Wyoming

The successful deep test of Mountain Fuel Supply Company is being followed by drilling No. 2 and No. 3 wells on the Church Buttes structure in Uinta County. This new oil and gas field is rated the major find in the Rocky Mountain area so far in 1946.

Mecosta County, Michigan, Test Finds Objective Dundee Dry

Rex Oil & Gas Company's Snider 1, NW NE SW 8-14n-7w, Mecosta County, Michigan, 1320 feet west of the company's Skalitzky 1 extension producer, drilled objective Dundee dolomite section dry at 3750 feet. Test was 28 feet low on objective and immediately discounted early hopes of a major field.

☆ California

Second Deep Test Slated for Belridge Area in Kern County

Second deep test scheduled for South Belridge area; discovery in the Santa Margarita in the Kern Front area is good for 130 barrels of 14-gravity oil; Barnsdall drilling third wildcat in Devils Den area; new completions in the "237" zone at Wilmington cause continuing rise in California crude output, now at 870,000 barrels a day; fishing job delays completion of East Los Angeles producer.

Kern County: A new deep test of the South Belridge area, announced by Richfield Oil Corporation, is indicative of the growing interest in the deep sand possibilities of the area. Two miles from where Richfield will drill, Belridge Oil Company has a wildcat down 11,400 feet.

Three companies besides Richfield are interested in the new play: Universal Consolidated Oil Company, Lincoln Petroleum Company, and Berry Oil Company. The companies have a total of 2400 acres under lease. Lincoln has 840 acres; Berry, 800 acres; Universal Consolidated, 400 acres; and Richfield, 360 acres. The area will be the subject of a thorough seismograph study, although tentative location for the test has been selected in SW 30-28s-21e.

The Belridge deep test is in Sect. 33. If the Richfield well is drilled on the site tentatively selected in Sect. 30, it will not be far from a deep well that made history in this area about a dozen years ago. General Petroleum Corpora-

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tion drilled Berry 1 in Sect. 30 to 11,377 feet, at that time the world's depth record. This test showed an accumulation of oil within the Temblor members, but mechanical problems finally compelled abandonment.

Bender Oil Operations' Kelly 2 in the Lerdo-West Front area of the Kern River field, 20-28s-27e, is credited with a new discovery in the Santa Margarita. The well was completed pumping 130 barrels of 14-gravity oil, 1 percent cut. Productive interval is 3449-3470 feet.

Barnsdall Oil Company is drilling Bates 3 in 20-25s-19e, a short distance east of the Devils Den field. Barnsdall intends to give this area a thorough test. While Bates 1 and 2, both drilled within the last two months, were abandoned, showings were of sufficient interest to induce the company to keep on trying. The first two wells were also in Sect. 20.

In its Temblor area wildcat, Temblor 4 in 17-29s-21e, Independent Exploration Company has apparently picked up the Carneros oil sand from which Richfield obtained a 1000-barrel well a month ago in its Miller & Lux Fee 2 in Sect. 18. Casing has been cemented at 2770 feet, where top of the Carneros oil sand was logged.

Fresno County: Bolsa Chica Oil Company is preparing to drill 36-1, an extension test of the Jacalitos field in 36-21s-15e.

Kings County: Standard Oil Company of California has regained circulation in its Kettleman Hills Middle Dome wildcat, 73-30V in 30-23s-19e. Drill pipe has been partially recovered and operator is running single shot to make another inside cut.

Los Angeles County: Two good-sized wells were completed in the "237" zone at Wilmington and the exploration of this deep sand is increasing on a broadening front. Bankline Oil Company completed U. P. 3 flowing 2085 barrels of 28.6-gravity oil hrough a 44/64-inch choke and 1,400,000 cubic feet of gas. Depth is 5951 feet. U. P. 4 is rigging up to deepen to the "237" and U. P. 7 is preparing to set casing above the pay. General Petroleum completed Harbor Community 1 in the "237" zone flowing 1214 barrels of 29.6-gravity oil through a 29/64-inch choke and 550,000 cubic feet of gas. These and other "237" zone completions have been principally responsible for the recent rise in California crude production to 870,000 barrels daily and a continued rise toward 900,000 barrels is coming unless some restrictive measures are taken in this field and elsewhere. Several California fields are producing substantially in excess of the rates recommended by the California Conservation Committee.

The expected completion of Richfield's Edison 1 in the East Los Angeles field has not materialized, with the operator continuing to fish for formation tester. Company's Vail 2 in Sect. 16 is coring at 8516 feet. There are indications that this well and Richfield's Keller 1 in Sect. 9, now coring below 8680 feet, may be too far to the east. Chanslor-Canfield Midway Oil Company's Bandini 1 in Sect. 21, now drilling below 11,200 feet, is considered by students of the field to be on the southeast edge of production.

Orange County: The second of 2 tests of the Richfield area to be drilled in the last month is also a failure. The joint test of Basin Oil Company and Wilshire Oil Company, Stern 1 in 33-3s-9w, has been abandoned at 3527 feet.

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ARKANSAS WILDCAT

Ouachita County—Failure: Jack Carnes' Myar Estate 1, c ne ne se 24-13s-19w, abnd 2400.

CALIFORNIA WILDCATS

Kern County—Failures: Richfield Oil Corp.'s Janes-U.SL. 1, 11-28s-19e, McDonald Anticline area, Tulare 145, Button Bed 350, L. Santos 415, Phacoides 568, Point of Rocks 600, abnd 750.

Wilshire Oil Co.'s Kalloch 1, 11-25s-18e, Devils Den area, Button Bed 510, Oligocene Kreyenhagen 1370, restricted Kreyenhagen 2350, Point of Rocks 2553, abnd 3100.

Kings County—Failure: Western Gulf Oil Co.'s von Glahn 14-8, 8-23s-21e, Dudley Ridge area, abnd 4841.

CALIFORNIA NEW PAY TEST

Kern County—Kern Front Discovery: Bender Oil Operations' Kelly 2, 20-28s-27e, pump 130 bbls 14-gr, fr Santa Margarita, td 3518.

FLORIDA WILDCAT

Levy County—Failure: Sun's J. P. Goethe 1, swc 31-14s-17e, abnd 3985.

ILLINOIS WILDCATS

Clay County—Failure: Robinson & Puckett's Gibson Sons 1, se ne se 3-4n-7e, abnd 3030.

Fayette County—Failure: J. R. Benson's Durre 1, sw se ne 1-5n-4e, abnd 2500.

Hamilton County — Failures: Magnolia's Boyles 1, ne sw se 7-5s-5e, abnd 3401.

Abbot Ponds' McGee 1, sw nw nw 3-7s-5e, abnd 3456.

Randolph County—Failure: Charles R. Larson's Wilge 1, ne nw nw 2-7s-6w, abnd 738.

Richland County — Failure: C. E. Brehm's Telford et al 1, nw nw nw 11-3n-10e, abnd 3257.

Washington County—Failure: Papoose Oil's Seibert 1, ne nw ne 19-2s-1w, abnd 1575.

INDIANA WILDCAT

Gibson County — Oil Discovery: Mid-Continent's Parkinson 1, sw se nw 24-1s-12w, pumped 28 bbls fr Ben. 2063-90 ft, td 2095.

KANSAS WILDCATS

Butler County—Failures: Dunne & Strait's King 1, se se nw 3-24s-4e, abnd 2555.

E. H. Adair's Johnson 1, se sw nw 29-25s-4e, abnd 2800.

Decatur County — Failure: Helmerich & Payne's Jorn 1, se se sw 28-2s-28w, abnd 4163.

Dickinson County—Failure: Veeder Supply's Schwarz 1, se se nw 18-16s-1e, abnd 2724.

Kearny County—Failure: Skelly's Leighton 11 nw nw se 11-21s-37w, abnd 2959.

SOUTH LOUISIANA WILDCATS

Point Coupee Parish—Failure: Humble's W. R. Buffington 1, fr sec sect 84 go wly alg sl 1020.9 th nly at ra to lcn in 84-1s-7e, Lettsworth area, abnd 11,210.

Terrebonne Parish — Failure: Humble's La. State Lse 601-1, T-20s-13e, Four League Bay area, abnd 13,680.

MICHIGAN WILDCATS

Allegan County—Failures: Lang Co.'s Ferrit 1, sw ne nw 11-3n-15w, abnd 1408.

L. C. Sleep's Arndt 1, sw sw nw 11-3n-14w, abnd 1575.

Calhoun County—Failure: C. A. Perry's Kirkland 1, ne sw se 34-3s-7w, abnd 1456.

Gratiot County—Failure: McClure Drlg. Co.'s Peiffer 1, nw ne sw 30-10n-4w, abnd 3190.

Missaukee County—Failure: L. R. Reese's Grice 1, nw se sw 20-23n-7w, abnd 1457.

Saginaw County—Failure: Bridgeport Oil Co.'s Allington 1, ne sw nw 33-13n-4e, abnd 3300.

Iosco County—Failure: Matlock and Welch's Johnson 1, ne nw ne 1-22n-8e, abnd 4100.

Newaygo County—Failure: Ashby Drlg. Co.'s LaValle 1, sw ne nw 33-16n-11w, abnd 1233.

MICHIGAN OUTPOST

Kent County—Rockford Failure: Rockford Paper Mill's Fee 1, se sw nw 1-8n-11w, abnd 2190.

MISSISSIPPI WILDCATS

Greene County — Failure: Humble's Greene County Bd. of Supervisors 2, 16-3n-7w, abnd 7126.

Jasper County—Failures: Harold L. Duck-Atlantic's Masonite 1, sw sw 9-10n-11w, Wilcox 1507, Eutaw 5745, Tuscaloosa 6262, Massive sd 7498, abnd 7934.

Southern Oil Prod. Co.'s J. E. King 1, se se 30-1n-12e, Wilcox 1430, Eutaw 5580, Tuscaloosa 6162, Massive sd 7256, abnd 7299.

Lamar County—Failure: Amerada's Anton Vesely 1, sw ne 7-1n-15w, Wilcox 2857, Tuscaloosa 8100, Massive sd 9428, abnd 9716.

Yazoo County—Failure: Southern Nat. Gas Co.'s Gammill Investment Co. 2, se sw se 6-9n-4w, Wilcox 2470, Tuscaloosa 6722, abnd 7649.

OREGON WILDCAT

Multnomah County — Failure: Richfield Oil Corp.'s Barber 1, ½ mi fr Portland, abnd 7885.

WEST TEXAS WILDCAT

Andrews County—Failure: Humble's Sims 1, (OWDD) c nw ne PSL 24, blk A-39, otd 9438, elev 3495, anhy 1626, Yates sand 2955, San Andres 4370, San Angelo 5670, Clear Fork 6130, Wolfcamp 8150, base red shale 8173, Ellenburger 10,665, abnd 10,765.

Dawson County—Failure: H. W. Snowden O&G Co.'s Kee 1, c nw nw E.L.&RR. 74, blk M, elev 3104, brown lime 4220, San Andres 4720, abnd 5100.

Hockley County—Failure: Stanolind's White 1, 660 ft out nwc Labor 3, Lge 704, State Capitol Lands, elev 3546, San Andres 3490, abnd 4566.

WEST TEXAS NEW TEST

Andrews County—Dollar Hide Deep Failure: Magnolia's Cowden 1-B, c sw sw PSL 3, blk A-55, ¾ mi ne of 7800-ft Devonian, elev 3169, Yates 2650, San Andres 4020, Glorietta 5170, Fullerton zone 6120, Woodford shale 7615, Devonian 7692, Silurian 8450, abnd 8769.

WEST CENTRAL TEXAS WILDCATS

Coleman County—Failure: H. T. Owen-P. H. Ryan's Cresswell 1, c nw ne GH&H Ry. 96, blk 2, elev 1860, Morris 3000-20, U. Capps 3022, Gardner 3127-34, Gray 3457-59, abnd 3528.

Shackelford County—Failure: C. J. Myers et al's Grothe 1, 2700 nsl 850, ewl T&P Ry. 6, blk 11, elev 1399, abnd 585.

NORTH TEXAS WILDCATS

Archer County — Oil Discovery: Grace & Grace's A. B. Edwards 1, 330 out of nec w½

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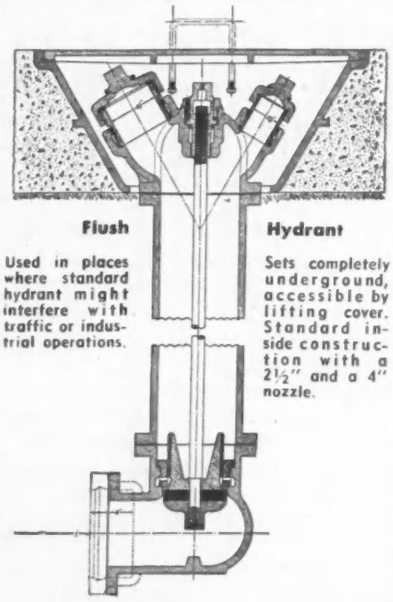

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lot 16, L. P. Hunt sbdn of Geo. C. Bruner sur, 2⅛ mi se Scotland multi-pay fld, nearest elev 964, Bend 5214, Barnett shale 5505, pump 35 bbls 38-gr oil, 35 bbls wtr, Basal Bend conglomerate perf 5490-5500, td 5741.

Cooke County — Failures: Akin-Dimock et al's Ramsey-Texaco 1, 150 fr m/s/nl 150 fr m/e/el of Fannie E. Parks sur, abnd 1450.

Redman Bros. et al's Wheeler 1, 330 out sec of H. Ledbetter sur, elev 852, abnd 3010.

Harvey Drlg. Co.'s Mitchell 1, 330 out sec B. B. Lee sur, abnd 2304.

Texas Co.'s Huchtons 1, 330 out nec 73½-ac tr H. O. Kohlman sur, abnd 2680.

Wichita County—Failures: D. H. Bolin et al's Goins 1-B, 1320 nsl 900 ewl blk 47, Red River Valley Farm Lands, abnd 2000.

J. E. Gray-W. F. Palmer's Burnett-Tide Water 1, 2028 nsl 1320 wel H&GN Ry. 1, abnd 1490.

Wilbarger County — Oil Discovery: Nat. Assoc. Pet. Co.'s Schmoker 1, c n½ nw ne H&TC Ry. 111, blk 14, 2½ mi n of prod, elev 1273, Gunsight 2605, Canyon 3500, Ellenburger 5693, fl 323 bbls 36.5-gr oil, natural, ½-in, fr Canyon open hole at 3514-27, td 5718, pb 3527.

NORTH TEXAS NEW PAY TEST

Archer County—Shallow Pool Deep Failure: G. E. Kadane & Sons' Wilson 1-B, 330 fr nwc lot 9, ATNCL sect 31, abnd 4420.

EAST TEXAS BORDER COUNTIES WILDCAT

Marion County — Lassater Oil Discovery: Magnolia's S. L. Orr 1, 1300 fr nl 1000 fr wl R. B. Fowler sur, Navarro 1702, Nacatoch 1935, Saratoga 2359, Pecan 2612, Blossom 3078, Georgetown 3770, Paluxy 4720, 1st anhy stringer 5830, massive anhy 6420, Pettit 7398, Travis Peak 7577-86, Cotton Valley 9265, perf 69 shots 7568-77, pump 97 bbls 40.9-gr oil, 41 bbls sw, td 10,513.

SOUTH CENTRAL TEXAS WILDCATS

Atascosa County — Failure: H. R. Smith-Skinner & Eddy Corp.'s Hurt & Tartt 1, 467 fr sel 1400 fr nel Jas. Wilkinson sur 144, 160-ac lse, abnd in Wilcox 3917.

Bexar County—Failure: Geo. Parker-Chas. L. McCune's F. Cunningham 1, 500 n fr w cor 27.5-ac lse, th 300 e at ra to len in J. M. Urriegas sur, sd 369, abnd 500.

SOUTHWEST TEXAS WILDCATS

Duval County—Failures: Forest Oil Corp.'s Peter McBride 1-A, 330 fr el 1650 fr nl lot 2, blk 24, Santos Garcia Gr, 1 mi se Realitos, abnd 5603.

H. H. Howell's Mrs. Lizzie Singer 1, 2970 fr el 475 fr sl 990 fr nl 200-ac lse, 2970 fr el 475 fr sl sur 241, e flk Palangana Dome, abnd 5005.

Southern Minerals Corp.'s Juan Benavides 2, 3536 fr nwl 3424 fr swl 1584-ac lse, sbdn 1 El Mesquite Gr, abnd 3370.

Starr County — Failures: Billstrom, Armstrong & Blackwall's Ramona Salinas de Mendoza 1, 480 fr sl 1209 fr el Jose A. Salinas sur 302, 160-ac lse, 4 mi sw Sacatosa gas fld, abnd 1201.

Coastal Refineries' Chas. Rogan Est. 1, 1980 fr swl 1980 fr sel blk 6 El Javali Gr, 468-ac lse, 3 mi sw Sacatosa fld, abnd 2513.

Webb County—Failures: H. B. Zachry Co.'s Valera Vela Cuellar 1, 1650 fr nel 1650 fr nwl sh 4, Cuellar Gr and 580-ac lse, abnd 2606.

Dulaney Oil Co.'s State of Tex. 2, 330 fr swl 1320 fr sel State sur 838, 69½-ac lse, 1 mi sw Aviators fld, abnd 2168.

D. J. Moss's J. O. Walker 1, 990 fr wl 425 fr nl s½ GC&SF sur 264, 320-ac lse, abnd 1734.

LOWER TEXAS COAST WILDCATS

Brooks County — Failure: Tom Graham's Prospero Mangell 1, 467 fr s&el tr 4 and 80-ac lse, out of sec 760-ac Standard of Tex. lse, 4 mi se Alta Mesa fld, show oil and sw, abnd 7310.

Calhoun County—Failure: J. C. Wynne's S. H. Wilborn 1, 433 n 289½ w fr sec 164.8-ac tr, Manuel Lopez Gr, 30-ac lse, 3½ mi sw Sheriff fld, abnd 7720.

Jackson County—Gas Discovery: Hewit & Dougherty's A. A. Johnson 1, 660 fr ne&sel 160-ac lse and lot 3, Hollingsworth Rch sbdn, Wm. Whitaker sur, perf 38 shots 4150-60, flow 2.5 mln gas, ¼-in, shut in press 1750 lbs, td 4760.

Jackson County—Failure: Jos. Hornberger's J. M. Bennett 1, 330 fr nwl 545 fr swl 3330 fr nel 577.6-ac lse, Valentin Garcia Gr, abnd 5751.

Live Oak County—Failure: H. H. Pressnall's I. W. Griffith 1, 330 fr ne&sel 203.4-ac lse and of blk 2, L. J. Sparks sur, ne N. Jacob fld, abnd 1130.

Refugio County — Failure: Seaboard of Dela.'s H. V. Smaystrla 1, 467 fr s&el 80-ac lse, e½ 160-ac tr, 1650 fr el 2500 fr nl Jos. Reese sur, abnd 6375.

Victoria County—Failures: Hiawatha O&G Co.'s Delia Joshua 1, 466 fr ne&sel blk 21, McKinnon sbdn, 1220-ac lse, F. G. Hidalo sur, abnd 5353.

Sterling O&G Corp.'s J. J. Welder 1-C, 4230 fr swl 785 fr sel of portion of 2980-9-ac lse, 6200 nw disc Welder 2, abnd 6008.

UPPER TEXAS COAST OUTPOST

Chambers County — Fig Ridge E. Flank Failure: Gulf's S. Steenerson et al 2, 1226 fr sl 467 fr wl 320-ac tr and T&NO sur, 3375 e

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■ FOR SALE—1¼" upset tubing, 2700 feet, or trade for 1500 feet 2" upset with eight round thread or Hydril insert joints. B. Edwards, 611 Terminal Building, Oklahoma City, Oklahoma.

■ One rebuilt draw works, with reverse clutch and compound, guards and walkways. Priced right. Unit Rig and Equipment Company, Sales Department, Tulsa, Oklahoma.

■ Two unit rig reverse clutches. Priced right. Unit Rig and Equipment Company, Sales Department, Tulsa, Oklahoma.

■ FOR SALE: Three new Franks Jr. Winches with Power Takeoffs. Will sell at reasonable discount. Write or contact Glen Bullard, Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

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■ WANTED: Operator for Electric Well Logging device in connection with core drilling program. Some operating experience necessary in well logging or Seismograph work. Large independent oil company will pay good salary and expense allowance to the right man. Box 30, The Oil Weekly, Houston, Texas.

Wanted: ENGINEER GRADUATE, under 37 years of age, with pipe line experience, for position in major pipe line company's dispatchers' office. Good chance for advancement. Address: 1302 Hunt Building, Tulsa, Oklahoma.

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■ ATTENTION LAND MEN: At your service on West Coast contacting Lease Interest holders—Texas, Oklahoma and Louisiana. Experience in Titles and Trading, Major Company reference. Address Box 35, c/o The Oil Weekly, Houston, Texas.

SITUATION WANTED

■ PETROLEUM ENGINEER, B.S. degree, Texas A. & M. College. 3 years field experience. Veteran. Desires position with oil firm with headquarters in Dallas. Box 28, The Oil Weekly, Houston, Texas.

■ DRILLING and PRODUCTION Supt. Age 44, 27 years experience in drilling and production operations. 22 years supervisory experience in drilling (rotary and cable tools), completions, production developments, workover operations and flush and stripper production. References if desired. Address: Box 32, c/o The Oil Weekly, Houston, Texas.

se Sun's Carrie Smith 1, nearest prod, 3550 w sw dry hole 1, abnd 9021.

UPPER TEXAS COAST NEW PAY TEST
Wharton County—Lane City Gas Discovery: General Crude's Security Bank & Trust Co. 1, 330 se at ra fr e bank Colorado River, 750 ne Well 3, 690 nw Well 2, 300-ac lse, S. Castleman sur 5, pay 4154, perf 3154-56, flow gas, no gge, shut in tp 1850 lbs, td 5503.

WYOMING WILDCAT
Carbon County — Oil Discovery: Wasatch-Cameron et al's Unit 1, sw 13-27n-98w, E. Bailey Dome (between Bailey Dome and Mahoney Dome), Tensleep top 6715, shot 503 qts, flow on test 100 bbls per hr 29-gr oil, testing further, td 6972, pb 6940.

WYOMING OUTPOST
Park County — Badger Basin Extension: Resolute Oil Co.'s N. P. 8, c ne se 7-57n-101w, nw extension, Frontier sd 8425-75, flow 65 bbls 48-gr per hr, ½-in, shut in, td 8476.

Assistant Research Directors Named by Standard of Indiana

Standard Oil Company of Indiana has announced the appointment, effective July 1, of three ne wassistant directors of research. J. E. Seebold will be assistant director in charge of process design and exploratory economics. Nathan Fragen becomes assistant director in charge of pilot plant development work. B. H. Shoemaker will be in charge of laboratory research on the production of chemicals from petroleum.

Dr. Seebold received his doctor's degree from Massachusetts Institute of Technology in 1939 and joined the Indiana research staff after two years on the M.I.T. faculty and director of the Parlin Station of the School of Chemical Engineering Practice.

Dr. Fragen did his graduate work at the University of Michigan and spent three years at the Bureau of Mines before joining Indiana Standard in 1934.

Dr. Shoemaker came directly to the company after receiving his Ph.D. from Ohio State University in 1930.

Effective at the same time, R. A. Steel will be in direct charge of process design work under Dr. Seebold, and A. L. Conn will be in charge of pilot plants, reporting to Dr. Fragen.

SITUATION WANTED

■ GAS ENGINEER with twelve years oil field and office experience. Natural-gasoline back-end and gas-engine compressor-plant operator, G.P.M. testing, gas gathering system sizing, gas super-expansibility curve calculations, recombination of hydrocarbon analysis, and general gas engineering work. Registered Texas Professional Engineer. Age 34. Address Box 31, The Oil Weekly, Houston, Texas.

Trustworthy, reliable, practical oil man, fifty years of age, specialized in secondary recovery, drilling and technical administration, with wide foreign experience, whose former oil properties abroad have been seized without compensation, needs job immediately. Will take any available job connected with production, drilling or administration in the oil fields. Can furnish highest references as to character and ability. Address: Box 37, c/o The Oil Weekly, Houston, Texas.

NOTICES

GEOLOGICAL MAPS
Covering the Gulf Coast of Texas and Louisiana, showing all new discoveries and all dry holes drilled to April 15, 1946. Dry holes show well-elevations, total depths, and paleontological data. Oil fields colored green, gas fields red, sulphur purple, geophysical prospects yellow, depleted fields brown. Gulf Coast of Texas in one section size 4⅛ ft. by 10⅛ ft. Scale one inch to two miles. Price on paper $50.00, on linen $75.00. Louisiana Gulf Coast covers from TSN to the Gulf drafted in two sections, scale one inch to two miles. Hand colored the same as the Texas Gulf Coast. Size of each section 3⅛ ft. by 10 ft. Price of each section $25.00 on paper and $37.50 on linen.
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WILDCAT STARTS

CALIFORNIA

Kern County: Amapola Oil Corp.'s 1, 6-6n-12w, Lancaster area, bldg rig.

Barnsdall Oil Co.'s Bates 3, 20-25s-19e, Devils Den area, ru.

L. S. Gilmour & Assoc.'s McKendree 37, 11-30s-29e, North Mountain View area, ru.

Standard Oil Co.'s 46-33, 33-29s-21e, Sheep Springs area, lcn.

Kings County: Pacific Central Oil Co.'s Finch 12, 1-24s-22e, Trico area, lcn.

Fresno County: Bankline Oil Co.'s Kenyon 1, 4-17s-15e, Cantua Creek area, lcn.

Ventura County: Bankline Oil Co.'s 'Black 104, 13-4n-18w, Del Valle area, ru.

Ojai Oil Co.'s Ojai 6, 12-4n-22w, Ojai area, lcn.

COLORADO

Routt County: Union's Beaver Creek 1, 24-4n-89w, rur.

Moffat County: Carter's North Craig Unit 1, 30-8n-90w, N. Craig (Cottonwood) area, lcn.

FLORIDA

Collier County: Humble's Lee Cypress Co. 1, sw se 28-47s-29e, rds.

Monroe County: Gulf's State 2, swc 15-67s-27e, lcn.

Volusia County: Sun's Powell Land Co. 1, nw nw 14-17s-31e, mim.

Walton County: R. D. Logan's Walton Land & Timber Co. 1, sw sw 14-1n-18w, prep to spud.

ILLINOIS

Clinton County: H. Hubard's Mahlandt 1, nw sw se 25-5n-3w, lcn.

Cumberland County: M. H. Richardson's Barnet 1, ne nw se 25-9n-10e, lcn.

Hamilton County: C. J. Simpson's Send 1, nw sw nw 27-4s-5e, lcn.

Shelby County: Texas Co.'s Mietzner 1, sw sw ne 5-9n-5e, lcn.

Coles County: Nation Oil's Wilson 1, se ne sw 4-13n-14w, dr.

Effingham County: A. S. Hammer's Smith 1, ne se ne 18-9n-4e, lcn.

Jefferson County: Ashland Oil's Barnett 1, se se nw 17-1s-4e, lcn.

Ashland Oil's Brookman Heirs 1, se ne nw 17-1s-4e, lcn.

Jersey County: Nat. Assoc. Pet.'s Stifle 1, nw se ne 6-6n-11w, dr.

Madison County: Joe Kesl, Jr.'s Messerli 1, sw ne nw 35-5n-6w, lcn.

E. P. Jarvis' Hitz 1, nw ne se 8-5n-5w, lcn.

Washington County: Ben Taylor et al's Bauza 1, sw se sw 6-3s-1w, lcn.

Fryer & Simpson's Pieozchalski 1, nw se ne 29-3s-1w, dr.

Wayne County: Ryan Oil's Matchett 1, nw nw se 19-1n-6e, lcn.

Deep Rock's Ulysses 1, ne nw nw 30-1n-6e, lcn.

Robinson & Puckett's Hale 1, ne ne ne 19-2n-7e, dr.

White County: C. A. Lynch's Golden 1, ne se se 21-5s-14w, dr.

INDIANA

Elkhart County: Floyd Lee's Fisher 1, 36-38n-5e, lcn.

Gibson County: British American et al's Hobson et al 1, nw se sw 16-3s-13w, lcn.

Green County: W. L. Lichlyter's Fulity 1, sw ne se 23-8n-3w, lcn.

Posey County: Paul Rossi's Rippey 1, se se nw 30-6s-13w, lcn.

Sullivan County: Andros Gulde et al's Mahan 1, 9-9n-8w, lcn.

Vandenburg County: C. R. Craft's Ireland 1, nw nw se 14-4s-10w, lcn.

Warrick County: John E. McCauley's Beasley et al 1, 12-6s-8w, lcn.

Gibson County: H. C. Hageman's Mauck 1, sw sw nw 3-2s-11w, drlg.

Posey County: F. A. Calvert, Jr. et al's Fretageat 1, ne nw se 24-5s-14w, lcn.

Wabash County: Joseph Minneci's Votaw 1, 12-27n-5e, drlg.

KANSAS

Barber County: Continental's Lake 1, se se sw 11-32s-14w, lcn.

Barton County: Potash Co. of America's Weber 1, ne se nw 35-19s-14w, ru.

Butler County: J. P. Gaty's Schwalter 1, ne nw sw 23-28s-3e, drlg 560.

Dickinson County: Vickers' Bozarth 1, ne ne nw 3-16s-1e, c&p.

Graham County: Potash Co. of America's Logue 1, sw sw nw 17-6s-24w, drlg.

Potash Co. of America's Waggoner 1, sw sw ne 36-6s-25w, drlg 2500.

Norton County: Potash Co. of America's Bennett 1, sw se se 19-5s-23w, mim.

Stafford County: Cities Service's Kipp 1 "B," nw nw nw 24-25s-14w, rur.

WESTERN KENTUCKY

Daviess County: Ransbottom's Barrett 1, 7-0-32, drlg.

Daviess County: Owensboro Forging Co.'s Fee 1, 17-P-29, dr.

Sylvester Yunkers' Mayfield 1, 5-N-32, dr.

J. E. Ellis et al's Shipp Heirs 1, 12-P-28, dr.

Henderson County: Neely & Zogg's Cosby-Inglehart 1, 6-O-26, lcn.

Cherry & Kidd et al's McNeely 1, 23-Q-20, lcn.

Lincoln County: Calif. Co.'s Spears 1, 13-L-57, lcn.

Ohio County: Ryan Oil's Smith 1, 15-J-31, lcn.

SOUTH LOUISIANA

St. Charles Parish: Atlantic's State-Lake Ponchartrain 1-D, 7550 n 9320 e fr swc T-11s-9e unit 2, blk 4, Lake Ponchartrain, 11,000-ft test.

MICHIGAN

Allegan County: Del Fortney's Pipe 1, se ne sw 25-2n-12w, dr.

Arenac County: D. F. Rayburn's Consumers 1, nw ne ne 13-20n-3e, lcn.

Barry County: Superior's Kotraba 1, sw nw nw 30-3n-10w, dr.

Bay County: Chapman Oil Co.'s Sovey 1, se se ne 24-15n-3e, dr.

Genesee County: Bridgeport Oil Co.'s Bailey A-1, sw sw se 6-8n-5e, rig.

Montcalm County: McClanahan Oil Co.'s Frost 1, se se nw 5-12n-8w, lcn.

Van Buren County: J. W. Lang Co.'s Meachum 1, sw sw se 5-2s-16w, dr.

Clare County: Gordon Oil Co.'s Case 1, nw nw sw 5-19n-4w, lcn.

Muskegon County: Jacob Bolema's Kops 1, sw nw se 33-11n-16w, dr.

Ottawa County: A. J. Boeve's Stellkamp 1, nw nw se 36-5n-14w, dr.

Van Buren County: W. D. Gannett's Chamberlain 1, ne nw sw 17-1s-15w, dr.

MISSISSIPPI

Leake County: Donald M. Reese's C. H. Denson 1, 29-9n-6e, mim.

Sharkey County: Maner Graham's Carpenter & Graft 1, se ne se 25-13n-7w, lcn.

Warren County: McAlester Fuel Oil Co.'s Anderson-Tully Lbr. Co. 1, ne ne 35-18n-1e, mim.

MONTANA

Big Horn County: Mackinnie's Douglas 1, c nw nw 3-1n-34e, Nine Mile area, Dakota test, rurt.

Meagher County: R. C. Tarrant's Holliday 1, sw sw 35-9n-10e, dr 700.

OKLAHOMA

Grant County: William J. Sherry's Staggers 1, ne sw sw 4-25n-3w, dr 430.

Osage County: A. G. Oliphant's Osage 1, sw ne ne 21-25n-4e, c&p.

WEST TEXAS

Andrews County: Atlantic's University-Texu 1-C, 661 snl 665 wel sect 10, blk 12, mim for 7300-ft Clear Fork test.

Garza County: Northern Ordnance's Eliza Walker 1, se se se H&GN Ry. 45, blk 6, 3500-ft test.

Howard County: Duncan Dlg Co. et al's B. M. Newton 1, c ne ne T&P Ry. 9, blk 33, T-1-N, 3200-ft San Andres test, combination rig.

Menard County: Warren Pet. Corp.-T. F. Morrow et al's Mrs. Ruby Russell 1, c ne ne sect 18, S. Wallick sur, 4300-ft Ellenburger test.

Pecos County: G. F. Aldrich et al's State Nat. Bank (El Paso) 2, c ne nw T.&St.L. Ry. 25, blk 140, 5000-ft Ellenburger test.

Scurry County: Lion Chemical Co.-Lion Oil Co.'s Frank Strom 1, 1836 ewl 662 nsl H&TC Ry. 198, blk 97, 3000-ft cable test.

Ward County: Phillips' University 1-B (OWDD), c nw nw sect 28, blk 16, elev 2652, otd 5020, mim to dd to 6500-ft Delaware test.

Winkler County: Stanolind's Sealy-Smith 8, c sw nw G&MMB&A 48, blk A, 1¼ mi s by e of North Monahans fld, 6800-ft Clear Fork test.

WEST CENTRAL TEXAS

Taylor County: Staley Oil Co.'s J. W. Teaff 1, 330 out nwc labor 22, Lge 124, Grimes CSL sur, 2750-ft rotary test.

Fisher County: Sunray Oil Corp.'s Robinson 2, 330 nsl 151 wel nw¼ H&TC Ry. 172, blk 2,

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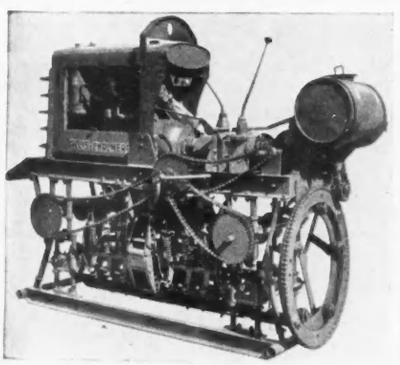

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NORTH TEXAS

Archer County: Harvey Drlg. Co.'s C. L. Abercrombie 1-A, 750 nsl 1500 wel of F. M. Taber sur, 1600-ft rotary test.

Harvey Dr. Co.'s Abercrombie 1-C, 1050 snl 1500 ewl S.P. Ry. 1, 1600-ft rotary test.

Harvey Dr. Co.'s Abercrombie 1-E, 450 nsl 1500 wel blk 14, Harris sbdn, 1600-ft rotary test.

Harvey Dr. Co.'s Abercrombie 1-F, 1500 out nec blk 47, Harris sbdn, 1600-ft rotary test.

Harvey Dr. Co.'s Abercrombie 1-G, 1500 nsl 750 ewl blk 62, Harris sbdn, 1600-ft rotary test.

Harvey Dr. Co.'s L. T. Key 1-K, 150 snl 1500 wel blk 43, Harris sbdn, 1600-ft rotary test.

M. H. Kennedy et al's Mrs. J. Turbeville 1, 150 snl 1320 wel blk 63, Jefferson CSL sur, 1400-ft rotary test.

Wichita County: Houtchans & Wolf's Brockreid 1, 150 snl 450 ewl sect 876, MEP&P Ry. sur, 2100-ft rotary.

Wilbarger County: S. H. Fagadau et al's W. T. Waggoner 1, 210 nsl 1320 wel H&TC Ry. 1, blk 5, 1850-ft rotary test.

EAST TEXAS

Smith County: R. F. Phillips et al's Phillips-Jordan 1, (OWDD) 467 out nwc 55-ac tr, or 2850 nsl 4050 wel Oscar Hawkins sur, 7 mi e by s of Starville, otd 5792, to dd to 8200.

SOUTH CENTRAL TEXAS

Atascosa County: H. R. Smith-Skinner & Eddy Corp.'s G. F. Wiegand 1, 467 fr swl 467 fr nwl 200-ac lse, s cor A. S. Donovan sur, ru 6500-ft test.

Batsorp County: H. F. Burkart's Mary Rivers Turner Est. 1, 547 fr nl 814 fr el 653 fr sl 161-ac lse, Jas. Standifer sur, 2250-ft test.

Bexar County: John Teagle-E. W. Gill's Randolph Lemmle 1, 330 fr el 1000 fr nl 161.65-ac lse, Alfonso Steel sur 18, mi 2700-ft test.

Williamson County: C. L. Brown, Jr.'s John Holub 1, 330 fr s&wl 71.85-ac lse, Jehu Bevil sur, 1000-ft test.

SOUTHWEST TEXAS

Duval County: Bridwell-American Republics Corp.'s E. & A. Flores 1, 330 fr sw&nwl 96-ac lse, J. Poitevent sur 529, sh 4, ru 5400-ft test.

Magnolia's Duval Co. Rch. Co. sect 273-1, 660 fr w&sl GC&SFRR sur 273.480-ac lse, 3500-ft test.

Santa Clara Oil Co. et al's Jas. F. Welder Heirs 1-B, 1104½ fr sl 3630 fr wl Samuel Alexander Lge sur 102, 1 mi w Seven Sisters fld, 300-ft test.

McMullen County: Dee Davenport's Annie Graves Dolph et al 6-A, 330 fr n&wl se¼ se¼ sect 65, Shumway sbdn Shiner Rch, 4200-ac lse, L. Musquiz sur, 8 mi sw Ezzell fld, lcn.

Webb County: Dulaney Oil Co.'s State of Tex. 3, 330 fr swl 330 fr sly/nl state sur 838, 69.5-ac lse, 1 mi sw Aviators fld, ru 2000-ft test.

Zapata County: J. O. Moss et al's Amelia de Vela 2, 467 fr n&el lot 14, Don B. Adams sbdn sh 3, El Grullo Gr, 2628.78-ac lse, 2 mi nw Charco Redondo fld, 1500-ft test.

LOWER TEXAS COAST

Goliad County: Sun's Victor Albrect 1, 660 fr sw&sel 700-ac lse, 1375 fr sl 1975 fr el Franklin Wright sur, 2 mi se S. Cabeza Crk fld, 2 mi e ne Albrecht gas-cond disc, 9000-ft test.

UPPER TEXAS COAST

Colorado County: Ohio Oil Co.'s Nada unit 1-A, start m/wly/nwc 758-ac lse go 1443 se alg swl th 1280 nely at ra being 600 s of nl of lse, Indianola RR Co.-J. D. Schultze sur sect 24, 10,500-ft test.

Fayette County: Continental's C. Vinklarer 1, 330 fr s&wl of m/swly cor 154-ac lse, 6900 fr el 520 fr sl S. Millet sur, lcn.

Harris County: Jack W. Frazier's R. J. Weis 1, 467 fr w&sl 80-ac lse, W. M. Waters sur, 4½ mi nw Fairbanks prod, mim.

Humble's Nora C. Kramer 1, 660 fr nl 2495 fr wl sect 36 640-ac lse, C. P. Collins sur (H&TC) blk 2, 2½ mi s N. Delhi disc well, 7500-ft test.

Matagorda County: Ralph A. Johnston's Live Oak Farms 1, 545 fr nl 660 fr el 70-ac lse, Josiah Tilley Lge, start sec Wallace sur, 9500-ft test.

Salt Dome Oil Corp.'s State-Matagorda Bay 1, 1980 fr n&el sect 159.640-ac lse, 6500-ft test.

Montgomery County: Humble's W. M. Wickizer 1, 676.5 fr el 2579.5 fr nl 329-ac lse, Jos. P. Harrison sur, 11,500-ft test.

Houston API to Meet

"Connate Water In Oil Sands" will be discussed by Owen Thornton of The Texas Company and Sam C. Oliphant of Stanolind Oil & Gas Company before the Houston Chapter of The American Petroleum Institute in the Texas State Hotel at 6:30 p.m. June 26, according to Tom Pennington, chairman of the program committee.

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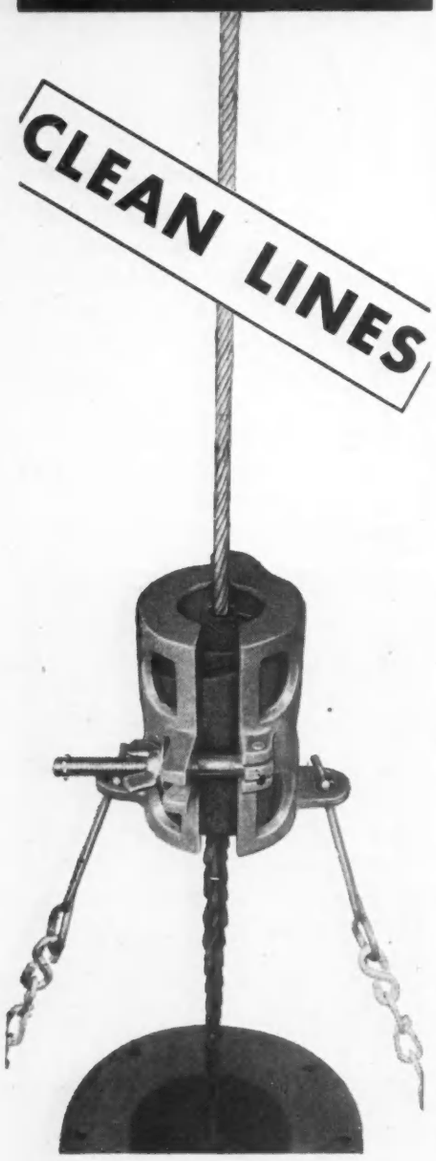

A clean wire line helps your crew. They can work safer and better on a clean floor, free from drippings. With a Patterson-Ballagh Wire Line Wiper the line is stripped completely of mud and oil. A compact steel housing contains a spiral rubber which is inexpensive and easily replaced. The rubber wipes the line as it comes out of the hole. Spark-proof. Use one on every well.

Now made of natural rubber.

See Composite Catalog

Patterson-Ballagh WIRE LINE WIPERS

Los Angeles 1 Houston 10 New York 6

SQUEAKS from the BULL WHEEL

Those Slacks Again

"Look at that guy walking ahead of us. He's got a grapefruit stuck in each hip pocket."

"You're wrong. Those ain't grapefruit and that ain't a him. It's a her."

This Curious World

An actress, upon seeing a questionable dame passing, sweetly remarked: "There goes the original good time that was had by all."

A wife is merely a school girl who grew up and found she still had to do her homework.

Women who believe no man is good enough for them are sometimes right—but more often left.

If all the people who sleep in church were placed end to end, they would be so much more comfortable.

The height of diplomacy: To say, upon surprising a lady in the bathtub, "I beg your pardon, sir."

Some people go to church three times during their lives: When they are hatched, matched and dispatched.

Seeing Red

A drunk was walking down the street with a big pink elephant following him. From time to time they would converse in friendly fashion, but finally the elephant got too chummy and began to rest its trunk heavily on the fellow's shoulder.

"Look here, you," said the drunk. "If you don't cut that out, I'm gonna take a couple aspirins and get rid of you!"

Safety First

A Scot aroused the curiosity of his fellow-travelers by leaping off the train at every stop, then breathlessly rushing back to his seat as the train got in motion. Finally, he was asked to explain.

"Well, I'm on my way to see a specialist about my heart. He says it's very bad, and if I'm not careful I might drop dead. So I'm just buying my ticket from station to station."

Bullish Beauty Market

A happily married couple—a jealous wife and a husband who believed in reincarnation. Finally, the husband died. Keeping a pact they had had for years, the wife communicated with him in the spirit world, twelve months after his untimely demise.

"Are you happy there, dear?" she asked.

"Happier than I ever was before," he replied. "The pastures here are greener, and it's indeed a beautiful world. And the weaker sex are the most gorgeous creatures you ever saw. Wistful eyes that speak of love; sleek bodies and beautifully rounded forms."

"Oh, dear," she exclaimed. "With so much temptation about you, I'm afraid you'll do something you'll be ashamed of. I do hope I can soon join you in heaven."

"Heaven?" boomed back the reply "Who said I was in heaven? I'm a bull in Montana."

Farewell to Arms

"Conductor, do I have time to say goodbye to my wife?"

"I dunno, Bub. How long you been married?"

Matter of Punctuation

"You know, Rastus, dat every time I kiss my wife she close her eyes and holler."

"I'll say she do!"

"What's dat?"

"I say, she do?"

Court of Appeals

A lawyer was attending a funeral. A friend arrived and took a seat beside him, whispering, "How far has the service gone?"

The lawyer nodded toward the clergyman in the pulpit and whispered back: "He just opened the defense."

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ATTENTION: INVENTORS

Manufacturer of Rotary Oil Drilling Equipment desires to take up on a royalty basis the manufacture of innovations in Drill Bits, Fishing Tools, or similar items, either already patented or in the stage of patent applications.

Inventors address Box 16-OW, c/o Oil Weekly, Houston, Texas.

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SHREVEPORT, LOUISIANA

George Sowards has become chief petroleum engineer of The Ohio Oil Company to succeed **James D. Wheeler,** who was recently appointed manager of the Grand Rapids, Mich., Division. Sowards

George Sowards

W. B. Berwald

has been assistant to Wheeler since February 1, 1942. He entered the employ of the company in 1923 as an engineer, and has had varied duties as superintendent of gasoline plant operations at Salt Creek, and petroleum engineer at Casper, Wyo., later becoming division petroleum engineer there.

W. B. Berwald is now assistant chief petroleum engineer, and will be headquartered at the general offices in Findlay, Ohio. He was division petroleum engineer of the Tulsa Division since 1939. He went to the company from the U. S. Bureau of Mines.

»

Ralph A. Hockenson, member of the petroleum engineering staff at Tulsa, succeeds Berwald. He spent four years with the U. S. Bureau of Mines and three years with Shell Oil Company. He started with Ohio as a geologist at Edmond, Okla., in 1937, and became district petroleum engineer at Tulsa in 1943.

»

J. Bruce Synnott, Jr., has resigned after 20 years with The Texas Company to become associated with his father, **J. B. Synnott,** in law partnership. Their offices are in the Gilbert Building, Beaumont, Texas. **Bruce Synnott** has practiced law for 17 years.

»

Lester F. Danforth is director of the Arkansas Oil and Gas Commission, succeeding **E. M. Dutton,** who resigned to engage in private business. Danforth has been production engineer for Deep Rock Oil Corporation, The Pure Oil Company, a treating engineer with Dowell Inc., treating and cementing engineer, and later assistant superintendent of the Kansas District for Halliburton Oil Well Cementing Company. He was superintendent of Halliburton's materials department at the time he joined the Army. In the Army he was in charge of procurement and distribution of petroleum for the ground forces, and later in the Philippines was chief requirements officer. He received his discharge as a major in April.

Lester F. Danforth

Courtney C. Brown, vice president of Standard Oil Company of New Jersey, was named by President Truman to the Famine Emergency Relief Committee, succeeding **Eugene Meyer,** Washington newspaper publisher who becomes president of the International Bank for Reconstruction and Development. During the war Brown was vice president of the Commodity Credit Corporaion.

»

Clarence J. Morley, Jr., who has been a scout for the Stanolind Oil Purchasing Company, Houston, for the past several years, recently was transferred to the Tulsa offices. **John N. Backus,** scout in the East Texas-Mississippi area, will replace Morley at Houston. **M. G. Langhorne,** formerly stationed in Midland, Texas, has assumed duties as scout in the East Texas-Mississippi area.

»

Bertric H. Mull, exploitation engineer in the Los Angeles office of Shell Oil Company, has been transferred to a similar post in the company's Coastal Division, with headquarters at Ventura.

Cleveland pioneered nearly a quarter century ago, the compact full-crawler mounted digging wheel. Cleveland's continued alertness to customers' requirements plus an aggressive open-minded engineering has contributed such other "firsts" as — transmission controlled speed changes and speed combinations, equalized drive to the digging wheel through enclosed differential, trailer mobility, unit-type construction minimizing repair time — most complete utilization of anti-friction bearings, welded construction of quality materials. THIS IS YOUR GUARANTEE THAT WITH CLEVELANDS ON YOUR JOBS YOU WILL GET "MORE TRENCH IN MORE PLACES AT LESS COST."

THE CLEVELAND TRENCHER CO.
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Jesse G. Kline, chief cost accountant for the Atlantic Refining Company, Philadelphia, was elected a national director of the National Association of Cost Accountants.

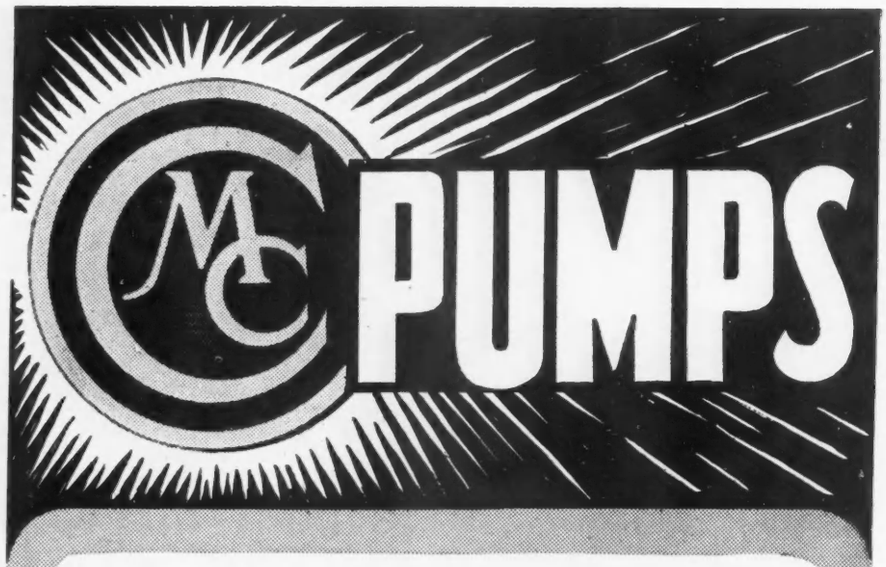
»

Dr. Carl A. Moore of the district geological staff of The Carter Oil Company in Oklahoma City, has resigned effective July 1. He will become assistant geologist of the Oklahoma Geological Survey, and instructor in the School of Geology, University of Oklahoma. His successor at Carter has not been announced.

R. Field Foster of the Lone Star Gas Company, Dallas, was elected a member of the national board of directors of the Liquefied Petroleum Gas Association. **Charles O. Russell** of Des Moines, Iowa, is the new president.

»

W. P. McGinnis, of the Cities Service Oil Company's legal department, resigned June 15 and will retire to his ranch near Denton, Texas. He has been associated with the company at Bartlesville for 16 years.



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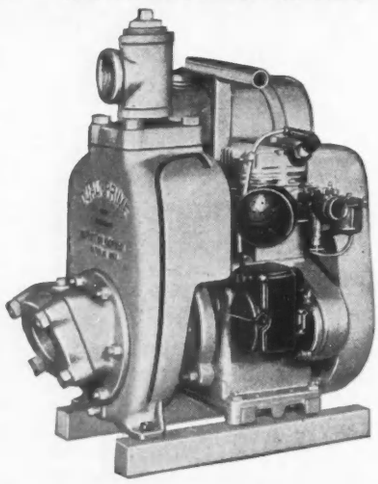
Pump illustrated, Model 8A, weighs only 115 pounds. Capacity to 8,000 gallons per hour . . . fast priming. Powered with single cylinder 4 h.p. engine. Compact . . . convenient carrying handle. One of the complete CMC Line of Centrifugals from 1½" to 10" size; also High Pressure and Diaphragm Pumps. Get new Pump Bulletin.



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Specializing in High Pressure Centrifugals . . . Dual Prime Centrifugals . . . Diaphragm Pumps for the oil field!

Edward G. Seubert, chairman of the executive committee of Standard Oil Company of Indiana, terminated his active participation with the company on his 70th birthday. He had been with the company nearly 54 years. He served continuously as a director since 1919, as president from 1927, and as chief executive from 1929 to 1945. He started his long career with the company as a clerk, which position he held until 1911, then becoming auditor.

Edward G. Seubert

»

Ray E. Miller, former vice president in charge of sales for Hanlon-Buchanan, Inc., who became vice president in charge of Gulf Coast sales for Warren Petroleum Corporation, Tulsa, when the latter purchased the Hanlon companies recently, will make his home and headquarters in Houston.

»

J. F. Thomas, Evansville, Ind., has resigned as vice president of the Frontier Oil Refining Corporation, to accept a position with J. F. Riddell Petroleum Company, New York City.

»

F. W. Mitchell, formerly with The Superior Oil Company in the Illinois basin, is now a consulting geologist at Mount Carmel, Ill.

»

Dr. Edmund S. Rittner joined the research staff of Philips Laboratories, Inc., as associate chemist. He received his B. S. degree in chemistry at Massachusetts Institute of Technology in 1939, and his Ph.D. in 1941.

»

Samuel B. Mosher, president and general manager of Signal Oil & Gas Company, has been chosen chairman of the board of directors of the Flying Tiger Line, an air freight line, with headquarters in Los Angeles.

»

Dr. Parke A. Dickey will direct the geological phase of research activity at the Tulsa laboratory of The Carter Oil Company.

Dr. Parke A. Dickey

After obtaining his degree in geology from Johns Hopkins University in 1932, Dr. Dickey spent several years in South America with Tropical Oil Company. Later, he was associated with the Pennsylvania Geological Survey, Forest Oil Company and Quaker State Oil Refinery Corporation.

He is a member of American Institute of Mining and Metallurgical Engineers, American Association of Petroleum Geologists, American Geophysical Union, and The American Petroleum Institute.

Elwin H. Schnitzler has been appointed sales manager of the manufacturing division of the Wheeling Machine Products Company, Wheeling, W. Va. He will supervise sales to the petroleum industry of the company's Seamless Merchant, A.P.I. Line Pipe, Upset and Plain Tubing Pipe Couplings, and Casing Couplings. Before the war he was associated with Sterling Oil and Quaker State refineries in a managerial capacity. He is now on terminal leave as a lieutenant commander in the Navy.

Elwin H. Schnitzler

»

John K. Campbell was elected vice president of the Republic National Bank of Dallas; **Robert E. Morgan** and **E. Leon Rogers** were elected assistant cashiers; and **A. J. Mason** was named assistant trust officer. Campbell, formerly an assistant vice president, began his banking career with First National Bank of El Paso in 1926, and went to Republic in October of that year. He holds the Army Service Ribbon for economies effected in the purchase of material and supplies in the Chemical Warfare Service.

»

H. B. Johnson, who has been general superintendent of the Haynesville Operators committee since its organization in 1944, has been named general manager of committee recycling operations. He succeeds **J. R. Butler,** who resigned to become vice president and general manager of the Old Ocean Oil Company, with headquarters in Houston.

»

George B. McCamey, Fort Worth operator and codiscoverer of the McCamey field, first West Texas area to receive large-scale development, was the guest of honor at a three-day celebration staged May 14-16 by the citizens of McCamey.

»

Thomas J. Bannan has been elected president of the American Gear Manufacturers Association, composed of approximately 125 gear manufacturers in the U. S. and including academic members from major educational institutions. Bannan is president and general manager of Western Gear Works, Seattle and Los Angeles. He has been associated with the company since 1917, starting as a machinist in the company before graduating in mechanical engineering from Santa Clara University.

Thomas J. Bannan

N. H. Hilton has been appointed acting superintendent of the Oklahoma division, The Texas Pipe Line Company, replacing **T. F. Reagan,** who retired January 1.

»

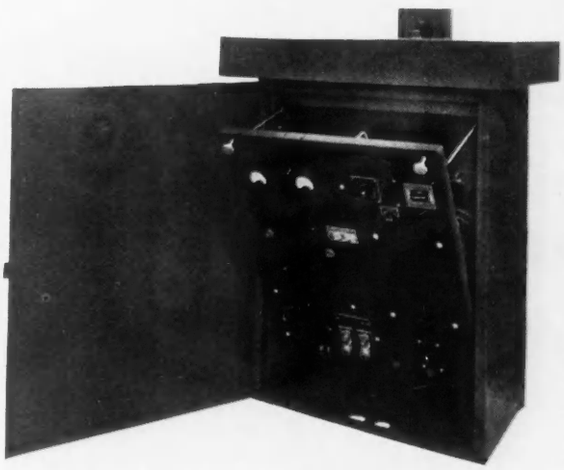
J. Norvelle Walker, vice president and controller of Royal Oil & Gas Corporation, has been elected president of the Philledalphia Control of Controllers Institute of America for 1946-47. **Raymond F. Bradshaw,** treasurer and assistant secretary of South Chester Tube Company, has been elected a director.

Reese H. Taylor, president of Union Oil Company of California, will speak on "Labor and Management Can Live Together," at a San Francisco Chamber of Commerce luncheon, June 27.

»

Walter C. Kerrigan has been appointed manager of the nickel sales department of The International Nickel Company, Inc., to succeed the late **Rudolph L. Suhl.** Kerrigan joined International Nickel in 1930 and has been an assistant manager of its nickel sales department since 1933.

SELENIUM Cathodic Protection RECTIFIER



Above illustration shows enclosure door open, with instrument panel tilted forward for inspection.

- Cathodic Protection Rectifiers have "Selenium" rectifier stacks.
- Available for use on single phase or 3 phase A.C. Power.
- Available — self cooled, fan cooled or air cooled.
- Available in all D.C. voltages and current outputs desired.
- Complete unit including rectifier stacks, control, weatherproof enclosure and pole mounting brackets.
- Rectifier fully protected against overload by means of thermostat and current overload relay.
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Class 930 Rectifiers are available for either single phase or 3 phase A.C. power supply. These rectifiers can be self-cooled, fan cooled or oil cooled.

The selenium rectifier stacks have practically unlimited life; are able to operate throughout a wide range of ambient temperatures; only light assembly pressures required to establish and maintain good connections between plates; has sustained efficiency, as the efficiency decreases only 5% or less after 1,000 hours of use.

Unit consists of Rectifier Stacks, A.C. Circuit Breaker, Transformer, Tap Changing Switch, Auxiliary Relay, Thermostat, Thermal Overload Relay, D.C. Ammeter, D.C. Voltmeter and Fan (on fan-cooled) enclosed in weatherproof heavy gauge enclosure, complete with pole mounting brackets and bolts.

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Circuit Breakers and Lighting Panels
Oil Field Motor Controls
Automatic Pipe Line Sampling Devices
Cathodic Protection Equipment
Switchboards
Instrument and Control Panels
Unit Substations

A. D. Stoddard and **Ben F. Saye,** veteran executives of Halliburton Oil Well Cementing Company, are leaving the company June 30. Stoddard has been a vice president, and connected with the company for 20 years. Saye, who has reached retirement age, has been in the legal department for almost that long and will continue on a retainer basis to handle legal matters now pending. **Robert O. Brown,** with the legal department for more than ten years, will succeed Saye.

Theodore Placette has been promoted from district foreman to assistant superintendent of The Texas-New Mexico Pipe Line Company with headquarters in San Marcos, Texas.

»

Martin M. Sheets has been promoted from district geologist of the Stanolind Oil & Gas Company to division geophysical coordinator with headquarters in Houston. **William R. Campbell** succeeds Sheets as district geologist.

R. W. Sanborn, manager of hose sales for the Mechanical Goods Division of The Goodyear Tire & Rubber Company, was presented with a 30-year pin. Sanborn has served in his present capacity since January, 1939. He began his Goodyear career as a clerk in the Akron Mechanical Goods department in 1916.

»

Charles S. Munson, was elected president of The Manufacturing Chemists Association of The United States. He succeeds **H. L. Derby,** president of the American Cyanamid and Chemical Corporation.

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J. W. SHARMAN, *Vice-President*

W. E. HONEY, *Atlanta Manager*

Deaths

David Heggie, 64, retired vice president and director of Shell Oil Company, died in Berkley, Calif., June 8 of a cerebral hemorrhage. Heggie had the longest service record of any Shell employe, more than 35 years. He joined Shell as assistant office manager at Oilfields, Calif., in 1909. He was transferred to the Martinez, Calif., refinery in 1916 and to the San Francisco office in 1918, when he became assistant treasurer. He became vice president in 1933 and a director in 1940. He retired from active service at the end of 1944.

»

Jesse F. Meadors, 65, former Tulsa resident and an employe of Sinclair Prairie Oil Company for many years, died in Kansas City, Kansas, June 16.

»

Henry G. Hunt, 46, former executive secretary of the Oil & Gas Association of Michigan and field manager of the Lupher Drilling Company in Illinois and Michigan, died June 15 following a brain operation. Hunt served as executive secretary of the Michigan association from 1933 to 1937 and represented Lupher from 1937 until 1942 in Illinois and Michigan.

»

Edwin Smith Anderson, 59, Tulsa, district manager of the Lee C. Moore Company, died June 17. Anderson had been associated with the Moore company 26 years. A native of Pittsburgh, he served 18 months overseas with the Medical Corps, World War I.

»

Charles E. Cummings, 79, assistant secretary of Raybestos-Manhattan, Inc., died June 6. One of the Manhattan Rubber Division's 52-year Pioneers, he first entered the rubber industry in 1881 as an employe at the New York office of the New York Belting and Packing Company, and joined Manhattan as bookkeeper in 1894. He was the third oldest employe in the plant in point of service.

»

C. H. C. Amerman, 62, died June 16 in Houston. He had been associated with The Texas Company's land department for 32 years.

National Tube Begins Work on New Warehouse Unit at Lorain

National Tube Company, United States Steel Corporation subsidiary, has begun construction of a ¼-mile long warehouse in the advancement of a broad postwar improvement program at the Lorain, Ohio, pipe mills. The new building is being planned to allow efficient and systematic stocking of standard and line pipe. Previously announced projects in the Lorain program are the installation of three additional by-product coke batteries and the concentration of the company's butt-weld pipe manufacture and galvanized facilities at Lorain.

Pacific Coast Plant Established By International Harvester

International Harvester Company has established its first Pacific Coast motor truck manufacturing plant at Emeryville, Calif., in the San Francisco Bay area. The company has a ten-year lease on a manufacturing plant owned by The Tide Water Associated Oil Company, and will occupy it in December. The company expects to employ initially between 250 and 300 men, and to have some trucks on the assembly line in February for delivery late that month. Production is expected to reach capacity levels by early summer of 1947.

Peter V. Moulder, vice president in charge of the Motor Truck Division, announced that the plant will produce six models of heavy-duty International trucks, especially designed for the highway and off-the-highway needs of truck operators in the eleven western states. International's transportation and automotive engineers made exhaustive studies of West Coast needs.

Moulder announced key personnel of the Emeryville Works: Adolph W. Engstrom, works manager; Robert Urich, chief engineer; F. C. Miller, auditor; E. H. Bickell, material controller; E. C. Becker, buyer; H. E. Straub, general foreman; H. W. Timm, service engineer; and A. S. Busselle, parts manager. Engstrom has had many years' experience in motor truck production on the Coast. Urich was reassigned from headquarters at Ft. Wayne, Ind., where he was in charge of special equipment engineering for Harvester. Miller and Bickell are transferring from the Chicago general offices, Straub and Becker from the company's heavy-duty truck factory at Ft. Wayne. Timm and Busselle were with International's Seattle and Los Angeles branches, respectively.

Kaiser Office Opened

Kaiser Export Sales, representing the industrial interests of Henry J. Kaiser, has opened a New York office under the direction of William F. Pelletier. Pelletier will report to W. J. Gleason, sales manager of Kaiser Export Sales, which represents the Iron and Steel Division of Kaiser Company, Inc., the Aluminum Division of the Permanente Metals Corporation, and the Permanente Cement Company, and Permanente Products.

Kerotest Acquires Los Angeles Plant

Kerotest Manufacturing Company, Pittsburgh, has acquired a new manufacturing plant in Los Angeles, where the present line of Security cast and forged steel valve and Kerotest valves will be produced for Pacific Coast and western distribution.

Kerotest Buys Security Valve Division, Forms Subsidiary

The Security Valve Division of Security Engineering Company, Inc., Whittier, Calif., a member of Dresser Industries, Inc., has been acquired by Kerotest Manufacturing Company.

Edward G. Mueller, Kerotest President, announced the formation of a new company—The Kerotest Pacific Company (to be operated as a subsidiary of the parent Pittsburgh company).

The purchase included all of the present stocks, designs, goodwill, and equipment of the Security Valve Division.

During World War II, the complete manufacturing facilities of both Kerotest and Security plants were devoted to the production of valves and fittings for war requirements. They were two of just 15 manufacturers in the entire United States to receive a fifth added star award for their Maritime "M" pennant.

Kerotest Buys Wiljack

Kerotest Manufacturing Company has acquired the Wiljack Company, South Pasadena, Calif., manufacturers of bar stock valves in carbon and stainless steel.

Klipfel Stock Sold

Economy Pumps, Inc., Hamilton, Ohio has purchased the stock of Klipfel Manufacturing Company, Chicago. Economy Pumps was founded in Chicago in 1914. It acquired the plant of Liberty Machine Tool Company in 1937. R. H. Thomas is president of the company. J. H. Swan of Klipfel Manufacturing Company remains in an advisory capacity and as chairman of the board of Klipfel.

Merger Announced

Merger of the Lorraine Corporation and the APCO Manufacturing Company into Lorraine, Inc., has been announced by David G. Lorraine, president of the new organization.

Gotkool
WATER CANS
& COOLERS
GOTT Water Coolers are the convenient way to keep drinking water handy to the worker, protect it from impurities. Their exclusive construction keeps water cool for long periods. Snug fitting large removable top, handy non-leaking push button faucet. GOTT Water Cans for handy field use. Your Supply Store has them, get one today! . . . .
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PURE WATER
GOTKOOL WATER COOLER
Made in 2, 3, 5, 8, 10, 15 and 20 gallon sizes with Push-Button Faucet.
GOTT
GOTKOOL WATER CAN
Made in 1½, 2, 3, 5, 10, 15 and 20 gallon sizes. (Push-Button Faucet at slight additional cost.
H. P. GOTT MFG. CO.
WINFIELD, KANSAS
KEEP PURE DRINKING WATER ALWAYS HANDY

PAGES 3079 THRU 3098 IN THE COMPOSITE CATALOG

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Oil Field Brines, Waters and Cores
Complete Evaluation of Crude Oils

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Mailing Lists—Personnel of Producers, Refiners, Natural Gasoline-Cycling Plants, Oil and gas Pipe Lines, Drilling Contractors, Supply Stores, Machine Shops. Write for catalogue. **Oil Industry Mailing List Company,** Tom Robinson, Manager, 319 Castle Building, Tulsa 3, Oklahoma.

FOR SALE

12,000′ new ⅞″ Jones No. 11 Sucker Rods, located Southern Kansas. Will deliver your lease or warehouse. Phone Fred M. Warden, Tulsa 27264, Atlas Life Building.

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NO-SMOKE

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Standco Brake Lining Co.
HOUSTON

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